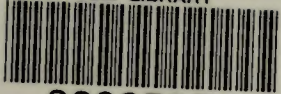


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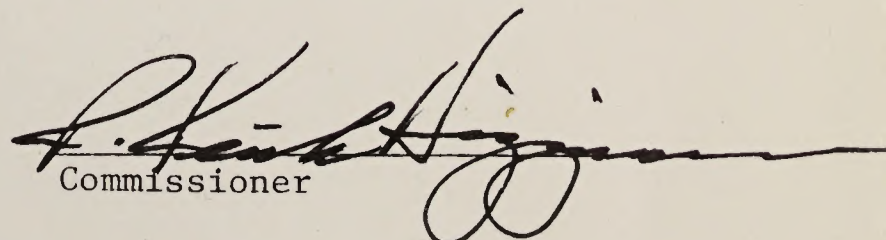
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DOLORES PROJECT
COLORADO

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SUMMARY

() Draft

(X) Final

Environmental Statement

Department of the Interior, Bureau of Reclamation, Upper Colorado Region

1. Type of action: (X) Administrative () Legislative

2. Description of the proposal: The Dolores Project would be located in Montezuma and Dolores Counties in southwest Colorado. It would involve the diversion of water from the Dolores to the San Juan River Basin. The project would include McPhee Reservoir on the Dolores River, the smaller Monument Creek and Dawson Draw Reservoirs in the San Juan River Basin, and two major conveyance systems. An average of 126,600 acre-feet of water annually would be developed for the irrigation of 26,300 acres of supplemental service land and 35,360 acres of full service land, for municipal and industrial use, and for fish and wildlife enhancement. Part of the water would be provided for the Ute Mountain Ute Indian Reservation. The project would include recreational facilities and acquisition and development of land for wildlife. Snow-melt floods on the Dolores River would be controlled. A 9-year construction period is anticipated.

3. Summary of environmental impacts and unavoidable adverse effects: Agricultural production would be increased, as would farm and farm-related incomes. Social conditions and long-term growth trends would be essentially unchanged. Forty-one families in McPhee Reservoir basin would be relocated and would undergo some social adjustments.

Average annual flows in the Dolores River would be reduced by 105,200 acre-feet. Flows in the San Juan River would be increased by about 24,300 acre-feet, resulting in a net decrease of 80,900 acre-feet in the Colorado River. Salinity in the lower Colorado River at Imperial Dam would be increased by an average of 10.1 mg/l from stream depletions and 1.0 mg/l from salt loading. The water quality in the San Juan and Colorado Rivers would not be significantly affected by increased uses of pesticides and fertilizers.

About 16½ miles of poor fish habitat would be flooded. New trout fisheries would be provided in project reservoirs and in 11 miles of the Dolores River below McPhee Reservoir. About 45 miles of warm water fishery would also be provided in the Dolores River. Also trout fisheries would be improved in existing reservoirs and in streams above McPhee Reservoir. Wildlife habitat would be reduced by the inundation of about 4,850 acres, the use of 670 acres for project structures, and the conversion of 7,500 acres of uncultivated land to irrigation. These losses would be largely compensated for by acquisition and development of land for wildlife management and plantings along canals.

Opportunities for white-water boating in the Dolores River would be decreased, but additional opportunities for other types of recreation would be provided along the river and at project reservoirs. The river's appeal as a wild and scenic river would be increased.

The natural setting would be intruded upon by man-made structures and some exposed foreshores. Most material sources would be inundated. About 215 archaeological sites would be disturbed.

4. Alternatives considered:

1. Four modifications of plan.
2. Four alternative uses of water.
3. Nondevelopment.

5. List of entities from whom comments have been requested or received: See list on next page.

6. Date made available to C.E.Q. and the public:

Draft statement: November 4, 1976

Final statement: MAY 9 1977

DISTRIBUTION LIST FOR FINAL ENVIRONMENTAL STATEMENT
DOLORES PROJECT

This list includes all Federal, State, and local agencies and private entities that received copies of the draft environmental statement, with those who responded in writing or who testified at the public hearing indicated by "*." Only those who responded or who testified will automatically receive this Final Environmental Statement.

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 *Governor, State of New Mexico, Santa Fe, N. Mex.
 *New Mexico State Clearinghouse and Planning Office, Santa Fe, N. Mex.
 New Mexico Department of Game and Fish
 New Mexico Environmental Improvement Agency
 *New Mexico State Engineer/Interstate Stream Commission
 *Montezuma County Commission, Cortez, Colo.
 *Dolores County Commission, Dove Creek, Colo.
 Durango City Government, Durango, Colo.
 Cortez City Government, Cortez, Colo.
 Dove Creek Town Government, Dove Creek, Colo.
 *Dolores City Government, Dolores, Colo.
 Ute Mountain Ute Indian Tribal Council, Towaoc, Colo.
 *Upper Colorado River Commission, Salt Lake City, Utah
 *Colorado River Board of California, Los Angeles, Calif.
 *Southwestern Colorado Water Conservation District, Durango, Colo.
 Dolores Water Conservancy District, Cortez, Colo.
 *Montezuma Valley Irrigation Company, Cortez, Colo.
 *Sierra Club, Rocky Mountain Chapter, Denver, Colo.
 Sierra Club, National Water Resources Commission, Santa Fe, N. Mex.
 New Mexico Conservation Coordinating Council, Albuquerque, N. Mex.
 Rocky Mountain Center on the Environment, Denver, Colo.

Colorado Open Space Council, Denver, Colo.
 Colorado River Water Conservation District, Glenwood Springs, Colo.
 National Audubon Society, Rocky Mountain Chapter, Boulder, Colo.
 *Colorado White Water Association, Boulder, Colo.
 National Wildlife Federation, Region X Director, Fort Collins, Colo.
 Trout Unlimited, Denver, Colo., and Albuquerque, N. Mex.
 *San Juan Ecological Society, Durango, Colo.
 Colorado Mountain Club, Denver, Colo.
 Colorado Wildlife Federation, Inc., Boulder, Colo.
 Izaak Walton League of America, Inc., Colorado Division,
 Westminster, Colo.
 The Nature Conservancy, Colorado Chapter, Denver, Colo.
 The Durango Bird Club, Durango, Colo.
 The Wilderness Society, Denver, Colo.
 New Mexico Wildlife Federation, Albuquerque, N. Mex.
 League of Women Voters, Durango, Colo.
 Colorado Field Ornithologists, Boulder, Colo.
 San Juan County Wildlife Federation, Farmington, N. Mex.
 Four Corners Regional Commission, Farmington, N. Mex.
 Defenders of Wildlife, Rock Springs, Wyo.
 New Mexico Citizens for Clean Air and Water, Los Alamos, N. Mex.
 San Juan Basin Wildlife Federation, Durango, Colo.
 Western River Guides Association, Salt Lake City and Green River, Utah
 Four Corners Environmental Research Institute, Durango, Colo.
 Colorado Water Congress, Denver, Colo.
 Club 20, Grand Junction, Colo.
 *Four Corners Expeditions, Mancos, Colo.
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 *Robert Leighton, Cortez, Colo.
 *Roy Crow, Durango, Colo.
 *Jerry Koskie, Dolores, Colo.
 *Nancy Colbert, Cortez, Colo.
 *Margaret Batten, Dolores, Colo.
 *Danny Randall, Dolores, Colo.
 *Bruce McAfee, Lewis, Colo.
 *Curtis Honaker, Dolores, Colo.

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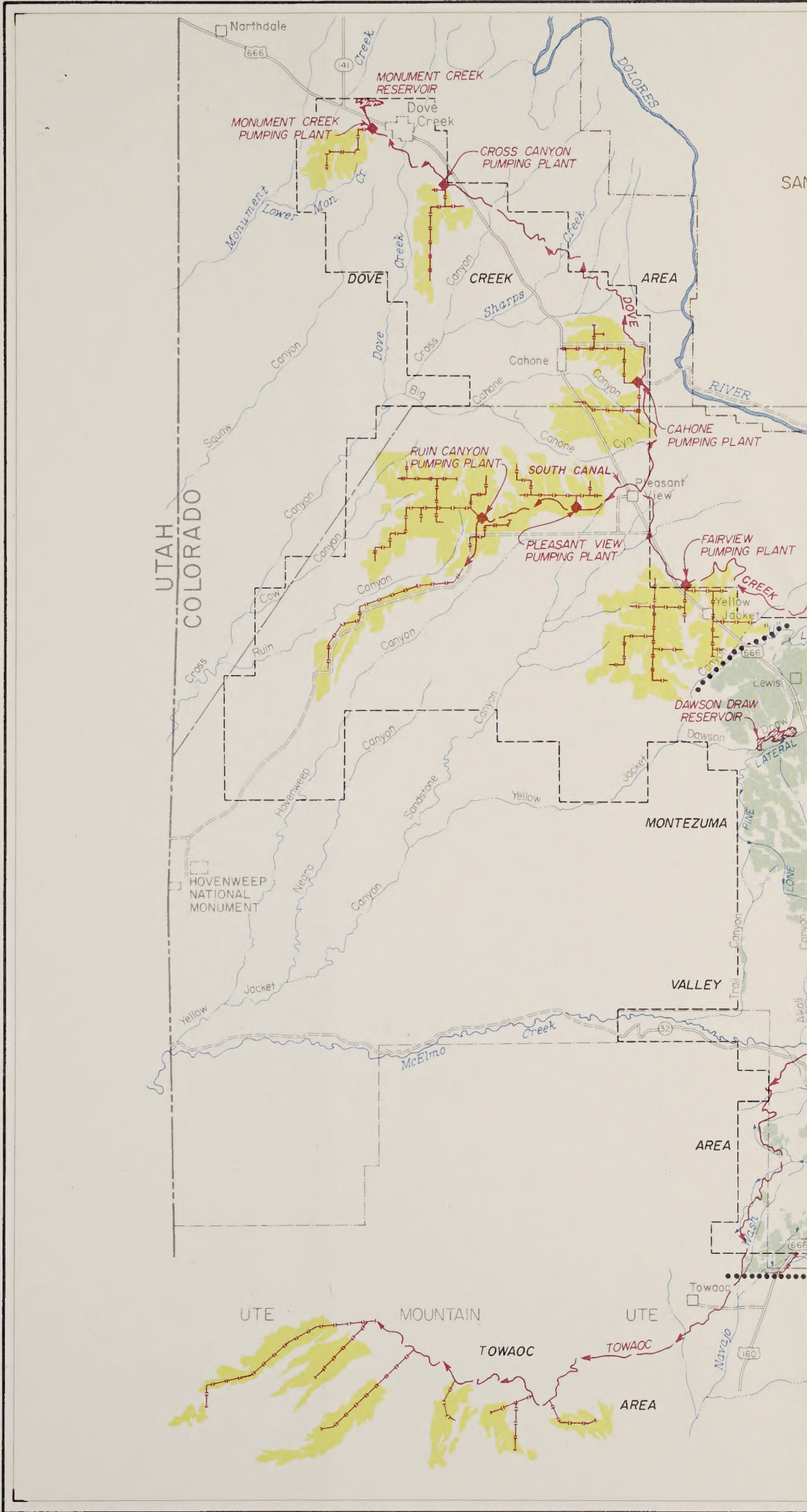
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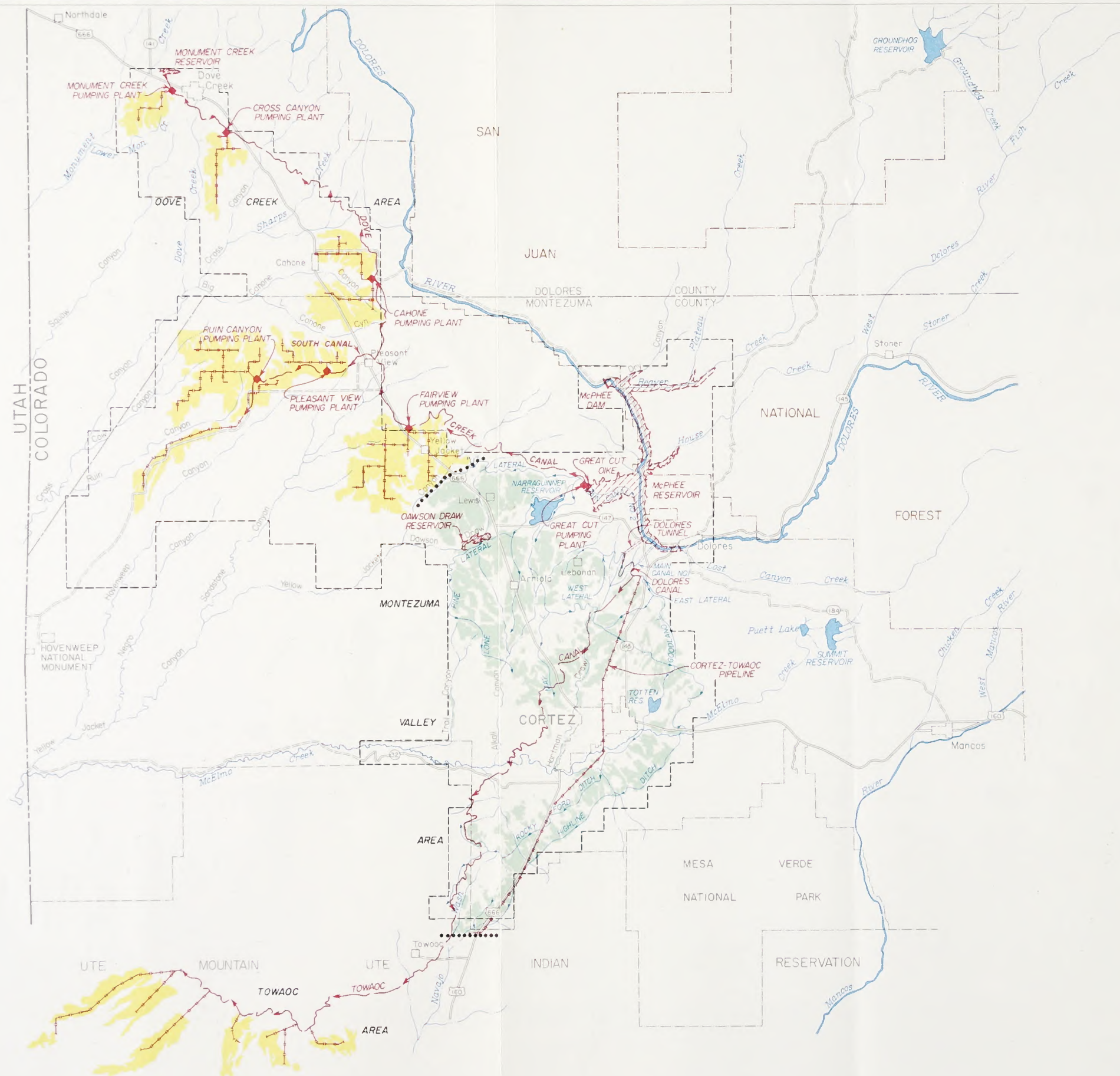
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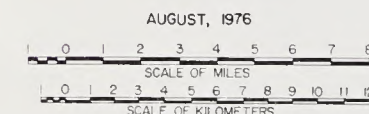




EXPLANATION

- Supplemental Irrigation Service Lands
- Full Irrigation Service Lands
- Proposed Dam and Reservoir
- Proposed Canal
- Proposed Pumping Plant
- Proposed Pipeline Lateral
- Proposed Dike
- Dolores Water Conservancy District Boundary

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
UPPER COLORADO REGION
DOLORES PROJECT
COLORADO
GENERAL MAP
MAP NO. 71-400-56



CHAPTER A

DESCRIPTION OF THE PROPOSAL

A. DESCRIPTION OF THE PROPOSAL

1. Introduction

This Final Environmental Statement has been prepared in compliance with Section 102(2)(C) of the National Environmental Policy Act (NEPA) of 1969, Public Law 91-190. A Draft Environmental Statement was filed with the Council on Environmental Quality November 1, 1976. A public hearing on the draft statement was held December 4, 1976, in Cortez, Colo.

The Dolores Project was authorized for construction by the Colorado River Basin Act of September 30, 1968 (Public Law 90-537) as a participating project of the Colorado River Storage Project. The project would commit to beneficial uses part of the streamflows allocated to Colorado by the Colorado River Compact of 1922 and the Upper Colorado River Basin Compact of 1948.

The Dolores Water Conservancy District and the Ute Mountain Ute Indian Tribe sponsor and actively support the Dolores Project. The proposed plan is the result of the cooperative endeavors of the Bureau of Reclamation, the sponsoring organizations, and a number of Federal, State, and local agencies. The Montezuma Valley Irrigation Company, which has undertaken most of the water resource development in the area to date, also supports project development.

2. Location

The Dolores Project area (shown on the general map) lies within Montezuma and Dolores Counties of southwestern Colorado, just east of the Colorado-Utah State line and north of the New Mexico-Colorado State line. The project would involve two adjacent river systems within the Upper Colorado River Basin. The Dolores River crosses the northeastern corner of the area and would provide the project water supply. Most of the water, however, would be diverted for use in the San Juan River Basin.

The project area consists of three service areas--Dove Creek, Montezuma Valley, and Towaoc. The Dove Creek area is located in the northwestern part of the project area in the vicinity of the town of Dove Creek, the seat of Dolores County. Located in the central part of the project area, the Montezuma Valley area is centered around the city of Cortez, the seat of Montezuma County. The town of Dolores is at the eastern extreme of the area. Both the Dove Creek and Montezuma Valley areas are within the Dolores Water Conservancy District. The Towaoc area is located in the southern part of the project area and is part of the Ute Mountain Ute Indian Reservation. It is named for the town of Towaoc, the tribal headquarters for the reservation.

3. Interrelationship With Other Developments

In its effect on total land and water resources, the Dolores Project is interrelated, at least indirectly, with other participating projects and storage units of the Colorado River Storage Projects and with the Colorado River Salinity Control Project. These interrelationships are discussed in Section C-14, Cumulative Effects. The Dolores Project would be more directly interrelated with the existing development of the Montezuma Valley Irrigation Company (MVIC) in the Montezuma Valley area. Availability of water for project development is dependent on an agreement presently being negotiated between the irrigation company and the Dolores Water Conservancy District. Essentially the agreement would provide that the company would not significantly expand its agricultural uses of water under existing rights. Project water and existing supplies of the irrigation company would be intermingled and conveyed in project and existing facilities. It is anticipated that existing reservoirs operated by the MVIC would also be coordinated in operation with project reservoirs to permit their stabilization for the benefit of fisheries and recreation, but no formal commitments for such operation would be obtained. At the request of the irrigation company no lateral and drainage facilities are planned for the Montezuma Valley area, although such facilities are planned for other portions of the project area.

Portions of the Dolores River have been studied for possible inclusion in the National Wild and Scenic River System (Public Laws 90-542 and 93-621). In the authorizing legislation for the study, the McPhee Reservoir site and Paradox Valley were specifically excluded from consideration. The studies were based upon the assumption that McPhee Reservoir would be constructed. In December 1975 the Departments of Agriculture and Interior and the State of Colorado published a draft report recommending that a 105-mile segment of the river extending from 1.3 miles below the McPhee Dam site to 1 mile upstream from Paradox Valley be included in the system because of its wild, scenic, and recreational qualities. The recommendation was based on the assumption that the Dolores Project would be built as planned and would improve these qualities of the river.^{1/} The State of Colorado recommended that Congress also include the West Dolores River when it makes a final determination. The report emphasized that the Dolores Project is compatible with designating segments of the river as part of the National Wild and Scenic River System. A final report on the study, dated March 1976, is being reviewed by the Office of Management and Budget and should be available for release soon. A Final Environmental Statement has been filed with the Council on Environmental Quality.^{2/}

^{1/} Colorado Department of Natural Resources, U.S. Department of Agriculture, and U.S. Department of the Interior, Dolores River: Wild and Scenic River Study Report (December 1975).

^{2/} U.S. Departments of Agriculture and the Interior, Final Environmental Statement: Proposed Dolores Wild and Scenic River (FES 76-56).

4. Project Purposes

The project would store and regulate the flows of the Dolores River to meet the present and future needs of the project area, developing usable water supplies of 90,900 acre-feet for irrigation, 8,700 acre-feet for municipal and industrial use, and 27,000 acre-feet for fish and wildlife enhancement. The project would also provide recreational facilities, aid in flood control, and contribute to economic development. Table A-1 contains a detailed breakdown of the project water allocations.

Table A-1
Water allocation

	Average annual water supply (acre-feet)	Land area (acres)
Irrigation		
Full service		
Dove Creek area	54,300	27,860
Towaoc area	22,900	7,500
Supplemental service		
Montezuma Valley area	13,700	26,300
Subtotal	90,900	61,660
Municipal and industrial use		
Dolores Water Conservancy		
District		
Cortez	6,200	
Dove Creek	600	
Rural areas	900	
Towaoc Indian area	1,000	
Subtotal	8,700	
Fish and wildlife use		
Released to Dolores River	25,400	
Reserved for future use		
Dolores Water Conservancy		
District	800	
Ute Mountain Ute Indian		
Tribe	800	
Subtotal	27,000	
Total	126,600	61,600

Throughout the project area the project irrigation supplies are expected to be used primarily for production of feed crops such as alfalfa and corn silage in support of general beef and dairy enterprises. In the Montezuma Valley area the project water would supplement existing supplies provided by the MVIC and would be used for improvement of existing crop yields and expansion of present livestock operations. In the Dove Creek and Towaoc areas, however, the project supplies would be used for new irrigation. Lands in the Towaoc area would be brought under cultivation for the first time. Lands in the Dove Creek area would be changed to production of feed crops from present dry farm operations for the production of pinto beans and wheat.

The project authorizing legislation gave the Secretary of the Interior the authority to deliver project water to farms in single ownerships of more than 160 acres on the Dolores Project so long as the farms are roughly equivalent to 160 acres of class 1 land in production potential. Farm budget studies in the Montezuma Valley and Dove Creek areas determined that an equivalent farm size for commercial full-time units would be 230 acres of class 2 land and 250 acres of class 3 land. Project land in the Towaoc Indian area is expected to be operated by the Ute Mountain Ute Indian Tribe as a tribal enterprise, and therefore the acreage limitations would not apply.

Ten owners in the Montezuma Valley area have land in excess of 230 acres, with eight of these owning more than 250 acres. No owners have land in excess of 460 acres of class 2 land or 500 acres of class 3 land, the allowable limit for which project water could be furnished under joint ownership. In the Dove Creek area 48 owners have land in excess of 230 acres of class 2 land, but only five of these owners have land with more than 460 acres, the allowable limit under joint ownership. A total of 2,972 acres, approximately 5 percent of the project, is held in excess ownership by these five land owners. The owners are expected to dispose of excess lands in order that the land could receive project water. The excess land could receive project water in existing ownerships for 10 years, however, if the owners signed recordable contracts agreeing to the disposition of the land within that period.

At present there are 140 ownerships in the Dove Creek area and all of these would be expected to participate in project development when water became available. The number of ownerships would increase slightly and gradually as some larger units were subdivided in compliance with excess land limitations. Other subdivisions would be possible as the productivity of the land increased with project development and as some large dry farms were subdivided to considerably smaller orchards and dairy farms. Land in the Montezuma Valley area is in 769 ownerships, about 500 of which are expected to participate in project development. No significant subdivision of land in this area is anticipated.

The municipal and industrial water supplies are planned to meet projected needs of the project area until about 2030. Some of the supply would be utilized as soon as it became available and the remainder gradually put to use as the needs developed. The supply is expected to be distributed approximately as shown in Table A-1. Distribution of the supply would be flexible, however, and within broad limits water could be shifted from one area to another if the needs did not develop as anticipated.

Most of the water provided for fish and wildlife would be used to maintain a fishery in the Dolores River. Some would be reserved for future fish and wildlife uses to be determined by the Dolores Water Conservancy District and the Ute Mountain Ute Indian Tribe in consultation with U.S. Fish and Wildlife Service and the Colorado Division of Wildlife.

5. Project Plan

a. Storage Reservoirs

Project storage would be provided at three reservoirs. The primary storage would be at McPhee Reservoir on the Dolores River near the eastern edge of the project area and 15 miles directly north of Cortez. The reservoir would be formed by McPhee Dam, to be constructed on the river about 10 miles downstream from the town of Dolores, and by Great Cut Dike, to be constructed in a saddle west of the river on the Dolores-San Juan Divide about 5 miles upstream from the dam. The lower portion of the reservoir would be on land presently in the San Juan National Forest, and the upper portion would be on land now in private ownership. With project development, however, it is anticipated that the forest boundary would be extended to include the entire reservoir area.

McPhee Reservoir would be the key feature of the project and would serve all project purposes. The other two reservoirs, comparatively small in size, would be Monument Creek Reservoir on an intermittent stream about 1 mile northwest of the town of Dove Creek and Dawson Draw Reservoir on Dawson Draw near U.S. Highway 160 about 9 miles north of Cortez. Monument Creek Reservoir would regulate the municipal and industrial supply for Dove Creek and nearby rural areas and provide water for recreation and fish and wildlife purposes. Dawson Draw Reservoir would be constructed specifically to enhance the area's fish and wildlife resource and would not supply irrigation or municipal and industrial water. Both Monument Creek and Dawson Draw Reservoirs would be constructed on lands now in private ownership that would be acquired for the project.

b. Water Distribution

Water from McPhee Reservoir would be released at three points--at multiple-level outlet works in McPhee Dam, at Great Cut Dike, and at the Dolores Tunnel which would be bored through the Dolores-San Juan Divide at the upper end of the reservoir to replace an existing tunnel of the MVIC that would be plugged and abandoned. Releases from the outlet works of the dam would be made to the Dolores River, while releases through the tunnel and dike would be conveyed to the San Juan Basin. Irrigation water supplies would be delivered to farm headgates. Pressure would be provided for sprinkler irrigation on the farms in the Dove Creek and Towaoc areas, but existing gravity systems would continue to be used in the Montezuma Valley area. Municipal and industrial water supplies would be delivered by the project to areas of use. Local entities would then be responsible for treating and distributing the water to the individual users.

(1) Downstream Releases

Releases from McPhee Reservoir to the Dolores River would be made to meet existing rights, to provide a stream fishery, and to provide storage for predicted flood flows. Flood flows would be predicted on the basis of snowpack accumulated in the higher mountains,

and reservoir releases made to lower the water level and provide storage space for the expected runoff. The releases in anticipation of flood inflows would be made on a scheduled basis, and advance public notice of these intended releases given so that white-water boaters could make advantageous use of the river.

(2) Releases Through Great Cut Dike

Releases from McPhee Reservoir through Great Cut Dike would be made to the project Dove Creek Canal and its branch, the South Canal, and to two existing MVIC facilities--Main Canal No. 2 and "U" Lateral. The Great Cut Pumping Plant would be constructed at the dike to lift water to the Dove Creek Canal whenever the canal was in operation since its initial elevation would be higher than the maximum water surface elevation in the reservoir. The "U" Lateral would be gravity fed at most times, but pumping through the Great Cut Pumping Plant to the lateral would also be necessary when the reservoir was at lower capacities. Main Canal No. 2 would be gravity fed at all times.

Water releases at the dike into Main Canal No. 2 and the "U" Lateral would be conveyed to presently irrigated lands in the northern and western portions of the Montezuma Valley area. Releases to the Dove Creek Canal would be conveyed northwestward for irrigation in the Dove Creek area and for delivery to Monument Creek Reservoir for regulation for municipal and industrial use in the area. Irrigation water would be turned out along the Dove Creek Canal to four lateral systems--the Fairview, Cahone, Cross Canyon, and Monument Creek. Irrigation releases also would be made to the South Canal, which would branch southwest from the Dove Creek Canal and in turn provide water to three lateral systems--the Pleasant View, Ruin Canyon, and Hovenweep. The lateral systems would extend to farm units and would consist of buried pressure pipes with a pressure turnout at each farm to permit sprinkler irrigation. Pumping plants would be constructed at the heads of all of the lateral systems except the Hovenweep, which would develop sufficient pressure from the ground slope to make a pumping plant unnecessary.

(3) Releases Through Dolores Tunnel

Water diverted through the Dolores Tunnel would flow by gravity from McPhee Reservoir into the project Dolores Canal, which would consist of enlargements of sections of the MVIC's East and West Laterals. The canal would convey existing and project supplies to lands presently served by the laterals and to Hartman Draw for lands presently served from the draw. In addition the canal would convey water to two project facilities that would branch from the canal--the Towaoc Canal, which would convey project irrigation water to the Towaoc area, and the Cortez-Towaoc Pipeline, which would convey municipal and industrial water to Cortez and Towaoc.

The Towaoc Canal would convey irrigation water to five buried lateral systems that would be constructed as project features in the Towaoc area. Sufficient pressure for sprinkler irrigation would be

developed in the systems from the ground slope. The water reserved for fish and wildlife uses in the Towaoc area also would be conveyed in the Towaoc Canal when uses for the water were determined.

The Cortez-Towaoc Pipeline would convey existing and project supplies to Cortez and project supplies to Towaoc. All of the supply in the pipeline would be conveyed for treatment at an existing plant of the city of Cortez or at a new plant under consideration by the Dolores Water Conservancy District, either of which would be near the canal alignment. After treatment, the water would be returned to the pipeline. Part would be turned out to Cortez, and the rest would be piped on to Towaoc.

c. Irrigation Scheduling

A program of irrigation scheduling would be instituted on project lands in the Dove Creek and Towaoc areas. The program is planned for water conservation but would also be effective in increasing agricultural production and decreasing salt contributions to the Colorado River. The program would be instituted by the Bureau of Reclamation but ultimately would be administered by the water users. Such a program is not planned for the Montezuma Valley area at the request of the Montezuma Valley Irrigation Company.

Local land owners would also have available valuable technical assistance through the Department of Agriculture's Soil Conservation Service. The application of the Service's recommended on-farm practices would aid in the conservation of water and help reduce the pollution potential of irrigation return flows.

d. Drains

Project drains would be provided for the Dove Creek and Towaoc areas based on needs demonstrated during the first years of project operation. As requested by the MVIC, drains would not be provided for the Montezuma Valley area. Accordingly, the Bureau of Reclamation has excluded any drainage deficient lands in that area from project service.

e. Recreation and Fish and Wildlife Developments

Recreational facilities would be provided at McPhee, Monument Creek, and Dawson Draw Reservoirs for such diverse recreational activities as fishing, boating, camping, picnicking, or sightseeing. Recreation facilities would also be constructed along the Dolores River to benefit boaters, fishermen, and others.

Land would be acquired and developed for wildlife at McPhee Reservoir to compensate for the loss of habitat resulting from the construction and operation of the reservoir. New habitat for upland game and waterfowl would be created at Dawson Draw Reservoir. New upland game habitat would also be created at Monument Creek Reservoir and along sections of project canals. Easements would be acquired along stretches of the Dolores River below McPhee Reservoir to improve access for fishermen.

6. Project Features

a. McPhee Reservoir

(1) Design Data

McPhee Dam and Great Cut Dike would be rolled, earthfill structures. At MCPhee Dam, multilevel outlet works (illustrated in Figure A-1) would be constructed in the left abutment of the dam. Two intake structures would feed water through the outlet works which would lead to a stilling basin. The river intake (a pipe through the base of the dam) could release water from the bottom of the reservoir at anytime, although it would be operated most often in the spring and early summer in anticipation of snowmelt inflow to provide white-water boating flows. The second structure would be a selective intake capable of releasing water from three different reservoir levels to control the water temperature for the benefit of the fishery downstream, particularly in the late summer, fall, and winter. A gated spillway with a concrete chute leading to a stilling basin would be located on the right abutment of the dam. The spillway, acting in combination with the outlet works, would have sufficient capacity to pass the maximum probable flood without damage to the dam. The spillway and outlet works would be designed so as not to induce gas supersaturation problems in the water spilled or released to the Dolores River.

At Great Cut Dike the outlet works would be located near the center of the structure and would regulate releases to Main Canal No. 2 and the Great Cut Pumping Plant. An inlet channel having a length of about 2 miles and a bottom width of about 20 feet would be required to allow reservoir water to reach the outlet works during periods of drawdown. The outlet works would be operated only during the irrigation season, from April to mid-October. Technical data pertaining to the dam and dike structures are presented in the following table.

Table A-2
McPhee Dam and Great Cut Dike

Feature	Crest (feet)			Material volume (cubic yards)	Discharge capacity (second-feet)	
	Height	Length	Width		Outlet works	Spillway
McPhee Dam	270	1,300	30	5,029,000	5,000	33,300
Great Cut Dike	64	1,900	30	189,000	820	None

McPhee Reservoir would extend for about 10 miles up the river to the town of Dolores, with arms extending 1 mile up Dry Canyon Creek, 4 miles up Beaver Creek, 1 mile up Plateau Creek, and 1.5 miles up House Creek. A large inactive capacity would be required in order that water could be diverted through the outlet works at Great Cut Dike, which would be about 196 feet higher than the riverbed at MCPhee Dam. The surcharge capacity would be provided to temporarily store flood flows until they could be discharged through the spillway and outlet works.

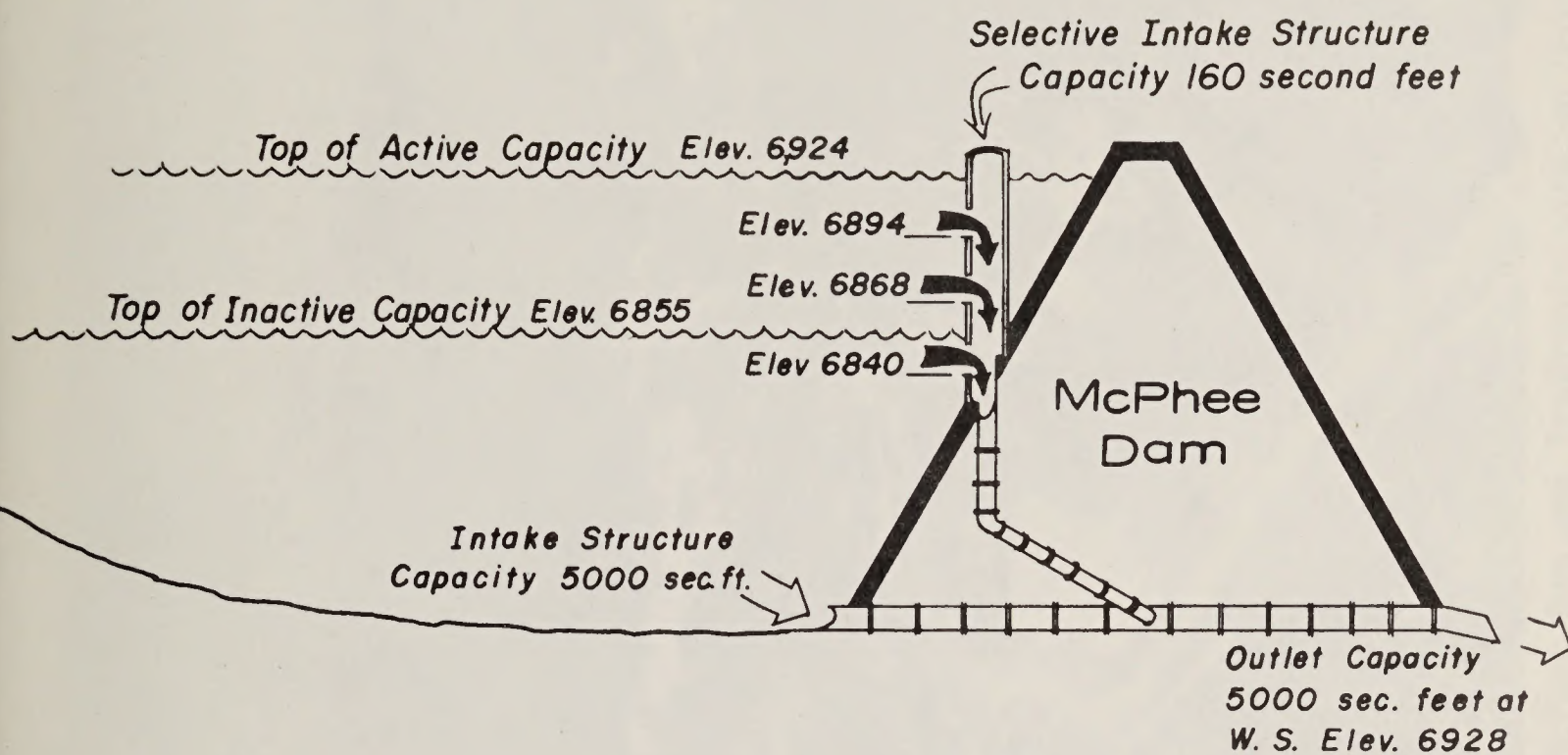


Figure A-1
 McPHEE DAM
 OUTLET WORKS — SCHEMATIC



Figure A-2--Aerial view of McPhee Dam and Reservoir site on Dolores River.



Figure A-3--Artist's concept of McPhee Dam and Reservoir.

Deposited sediments would occupy an estimated volume of 11,000 acre-feet after 100 years. Table A-3 gives the capacities of the reservoir.

Table A-3
McPhee Reservoir capacities

	Capacity (acre-feet)	Elevation (feet)	Surface area (acres)
Active capacity	229,000	6,924	4,470
Inactive capacity	152,000	6,855	2,160
Dead storage	100	6,676	24
Total	381,100		
Surcharge capacity	18,200	6,928	4,600

An area at the head of the reservoir in the lower end of the town of Dolores would be earth filled to protect the town from back-water flooding during high inflows and to prevent the occurrence of a swampy area and mud flats during low water levels in the reservoir. The fill would cover an area of about 45 acres and would contain about 462,000 cubic yards of pervious material. The area would be covered with about 24,000 cubic yards of topsoil from the reservoir basin and then landscaped. An additional 35,000 cubic yards of fill would be used to raise existing dikes along the river at the town to offer the town better flood protection than it now has.

(2) Reservoir Clearing and Relocation

Construction of McPhee Reservoir would require the clearing of about 900 acres of vegetation within the reservoir basin up to the top of the active capacity. All trees and brush measuring more than 5 feet in height or 2 inches in diameter would be uprooted or cut off at a maximum stump height of 6 inches, measured on the uphill side. All downed timber and floatable or combustible materials larger than 4 inches in diameter or longer than 5 feet would also be cleared. Merchantable timber would be beneficially used. Any other materials would be bundled together and anchored to the shallower portions of the reservoir bottom to provide food and cover for fish or disposed of at the project site. Waste material would be burned in accordance with Federal, State, and local standards, and the residue would be buried. Waste could also be chipped and then buried or used for mulch in seeding operations.

The construction of the reservoir would require the relocation of 120 people and 45 houses presently found within the proposed reservoir take line. Of the 45 houses, 21 are farm homestead dwellings within the proposed reservoir basin and part of the land fill area on the outskirts of the town of Dolores, and the remainder are within the land fill area in the town. Four of the houses are unoccupied at present.

A preliminary review of the area's housing market and economic profile of residents who would be forced to relocate has been completed. A relocation plan is being developed around this study and supplemental investigations and will be completed before any negotiations are undertaken for the acquisition of properties necessary to project

construction. Indications are that there is a shortage of adequate replacement housing in the town of Dolores and that many of the residents facing relocation have the type of employment or are in an income range which would make it undesirable for them to relocate in other localities where replacement housing might be available. If it is determined, as now appears likely, that construction of replacement dwellings would be necessary to relocate these residents in or near the town of Dolores, necessary contracts would be made with the Department of Housing and Urban Development and other appropriate Federal and State agencies for the construction of the replacement housing units. Most of the individuals now living on the 11 farmsteads have indicated that they would prefer to relocate on like farmsteads in the area or to relocate on their remaining lands outside of the reservoir take line and acquire supplemental acreage to replace their lost lands. Replacement farmsteads are limited, however, and some of the people may not be able to find such replacements. Accordingly, the overall plans for construction of dwellings would include replacement housing for those displaced from farmsteads if sufficient replacement farmsteads were found to be unavailable. All relocations would be accomplished under the provisions of Public Law 91-646 of January 2, 1971, entitled, "Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970."

Because the sewage treatment plant of the town of Dolores is within the proposed reservoir area, project funds would be provided for the design and construction of a new sewage treatment plant of equivalent capacity and functional performance as the existing plant. The plant would meet present day effluent standards and would also provide the degree of treatment necessary to meet higher discharge standards that could be expected because of McPhee Reservoir. It is likely the plant would be at an elevation higher than the town in which case funds would also be provided for pumping costs. The town would contract for the actual design and construction of the new facility.

The construction of the reservoir would entail the relocation of Forest Service and Montezuma County roads (see Figure A-17). The replacements for the roads would include a 6.9-mile access road to McPhee Dam from Colorado State Highway 147 by way of Great Cut Dike, 0.9 mile of new road from McPhee Dam downstream to the existing gravel road along the river, 2.3 miles of new road from McPhee Dam to the existing Dry Canyon road, and 2 miles of new gravel road from County Road 31 to replace an existing road to a gravel pit in May Canyon. These roads would be constructed to current county standards and paved. In addition, about 0.3 mile of existing road to the Dolores cemetery would be raised to the elevation of the landfill over which it would pass.

A family plot, containing 23 graves, and the McPhee cemetery, containing 52 graves, would be relocated. The Dolores cemetery below the town would not be relocated since access to the cemetery and protection from flooding would be provided. Miscellaneous relocations would include a stream gaging station, approximately 4 miles of telephone line, and 14 miles of power line. A natural gas storage well would be capped, and 6.5 miles of 2-inch natural gas lines would be abandoned.



Figure A-4--Aerial view of the Great Cut Dike site.



Figure A-5--Artist's concept of Great Cut Dike. Viewing from left to right, the alignment of the proposed Dove Creek Canal and the existing "U" Lateral and Main Canal No. 2 are shown leading from the dike.



Figure A-6--Proposed land fill area near the town of Dolores.

(3) Reservoir Operations

McPhee Reservoir project operations have been simulated on a monthly basis, using the runoff data available during the 46-year period of 1928 through 1973. The study assumes that prior nonproject water rights would be fully supplied in each year and that the MVIC would operate its three existing reservoirs (Groundhog, Narraguinne, and Totten) in coordination with the project. Water could be used from McPhee Reservoir before the MVIC reservoirs were drawn down in order to permit stabilization of the smaller reservoirs.

Because of the river flow pattern, McPhee Reservoir would fill fairly slowly during the winter and more rapidly from March through May. Storage would decrease in the summer and fall when increasing water demands would contrast with sharply declining streamflows. The average seasonal drawdown would be 25 feet, reducing the water surface to an area of 3,310 surface acres and exposing about 1,160 acres of foreshore. About 12 feet of the drawdown would occur during July alone. According to the operation study, the largest drawdown would be 50 feet, to the top of the inactive capacity. This level was reached in the late summer and early fall during 8 years of the 46-year study period, including 5 years during a critical drought that lasted from 1951 through 1959. Table A-4 illustrates the reservoir content and drawdown during representative wet, normal, and dry years.

Table A-4
McPhee Reservoir
end-of-month content

Month	Wet year (1942)		Normal year (1962)		Dry year (1959)	
	Content (acre- feet)	Surface area (acres)	Content (acre- feet)	Surface area (acres)	Content (acre- feet)	Surface area (acres)
January	381,100	4,470	179,300	2,590	253,300	3,450
February	381,100	4,470	182,500	2,590	250,700	3,420
March	381,100	4,470	186,600	2,630	252,000	3,420
April	381,100	4,470	277,900	3,630	257,700	3,480
May	381,100	4,470	341,100	4,160	263,200	3,510
June	381,100	4,470	343,200	3,720	219,900	3,040
July	331,700	4,060	290,200	3,480	163,000	2,280
August	300,700	3,840	257,300	3,480	152,000	2,160
September	280,300	3,660	238,700	3,280	152,100	2,160
October	274,500	3,630	235,000	3,240	152,100	2,160
November	274,100	3,600	235,100	3,240	152,100	2,160
December	274,000	3,600	234,500	3,240	152,500	2,160

Reservoir operations would help to control flood water downstream along the Dolores River. Predictions would be made of high runoff from melting snow which might flow over the spillway, and in anticipation of such runoff controlled releases could be made to increase the storage space for control of the flows. By means of such releases and by opening of the spillway gates if the floods were larger

than the storage capacity, the reservoir would decrease flood damage downstream. The releases and spills would average 76,100 acre-feet annually, occurring primarily in April through July. From the second half of April to the end of June, the releases for flood control, averaging 66,000 acre-feet, would be made in a pattern conducive to white-water boating on the river.

b. Monument Creek Reservoir

(1) Design Data

Monument Creek Dam would be a rolled, earthfill structure. The outlet works would be located in the left abutment and an ungated spillway would be located in the right abutment. Acting in combination, they would protect the dam from flood inflows. The outlet works would in addition regulate releases to the water users' water treatment plant and would be operated year-round. Technical data pertaining to the dam structure are shown in Table A-5.

Table A-5
Monument Creek Dam

Crest (feet)			Material volume (cubic yards)	Discharge capacity (second-feet)	
Height	Length	Width		Outlet works	Spillway
43	2,850	30	152,000	55	432

The reservoir would extend about 1.2 miles up an intermittent tributary of Monument Creek. Surcharge capacity would be provided to contain flood inflows until they could be discharged over the spillway or through the outlet works. Accumulated sediments would occupy an estimated 92 acre-feet after 100 years. Capacities would be as shown below.

Table A-6
Monument Creek Reservoir capacities

	Capacity (acre-feet)	Elevation (feet)	Surface area (acres)
Active capacity	560	6,798	84
Inactive capacity	70	6,787	25
Dead storage	60	6,783	14
Total	690		
Surcharge capacity	635	6,804	133

(2) Clearing and Relocations

The construction of Monument Creek Dam and Reservoir would require no clearing and no relocation of private dwellings. Approximately a half mile of a county road in the vicinity of the reservoir site would be relocated across the dam, and an access road would be constructed to a proposed recreation area on the south shore.



Figure A-7--Aerial view of the Monument Creek Dam and Reservoir site.



Figure A-8---Artist's concept of Monument Creek Dam and Reservoir. In the background, the Dove Creek Canal is shown leading to the reservoir.

(3) Reservoir Operations

Monument Creek Reservoir would receive project water from McPhee Reservoir via the Dove Creek Canal only from April through mid-October since the canal would be operated only during the irrigation season. The reservoir operation would be generally uniform from year to year. The largest drawdown would be 11 feet during the winter, when inflows from McPhee Reservoir would be halted, but municipal and industrial releases would still be made through the outlet works. Table A-7 shows the average end-of-month contents for the reservoir.

Table A-7
Monument Creek Reservoir
Average end-of-month content

Month	Content (acre-feet)	Surface area (acres)
January	390	56
February	290	46
March	190	33
April	130	25
May	390	56
June	290	46
July	190	33
August	390	56
September	690	84
October	690	84
November	590	76
December	490	62

c. Dawson Draw Reservoir

(1) Design Data

Dawson Draw Dam would be a rolled, earthfill structure. The outlet works and spillway would be located in the right abutment of the dam. The outlet works would have no day-to-day operational function but would be provided so that downstream flows could be maintained during the initial filling and so that the reservoir could be drained if necessary. Table A-8 provides technical data about the dam.

Table A-8
Dawson Draw Dam

Crest (feet)			Material volume (cubic yards)	Discharge capacity (second-feet)	
Height	Length	Width		Outlet works	Spillway
56	1,085	30	106,000	150	9,300

Dawson Draw Reservoir would extend about 1.5 miles up Dawson Draw. A surcharge capacity would be provided to store flood flows

until they could be discharged over the spillway. Sediments would occupy a volume of 480 acre-feet after 100 years. Capacities would be as shown in Table A-9.

Table A-9
Dawson Draw Reservoir capacities

	Capacity (acre-feet)	Elevation (feet)	Surface area (acres)
Inactive capacity	3,210	6,543	294
Dead storage	100	6,520	20
Total	3,310		
Surcharge capacity	2,360	6,550	394

(2) Clearing and Relocations

The construction of Dawson Draw Reservoir would require no relocations, but a portion of a county road would be abandoned. U.S. Highway 666 and two county roads would provide access. The reservoir basin would not be cleared since the vegetation would provide for better fish and wildlife habitat.

(3) Reservoir Operations

Dawson Draw Reservoir would be operated to provide habitat for fish, waterfowl, upland game, and other wildlife. It would initially be filled with water diverted from McPhee Reservoir through an existing MVIC canal, and subsequently its level would be maintained with irrigation return flows accumulating in the reservoir. The water surface would fluctuate only a few inches, even during dry years, and the inflow would spill to maintain flows below the dam.

d. Conveyance Systems

(1) Dolores Tunnel

The Dolores Tunnel would be a concrete-lined structure 1.3 miles long. It would have a working diameter of 9 feet and a maximum capacity of 520 second-feet. A gate house at the intake side of the tunnel would regulate releases to the Dolores Canal. A 4,000-foot-long section of the river channel within the reservoir basin would be excavated to form an inlet channel 16 feet deep and 20 feet wide at the bottom, allowing the delivery of water to the tunnel when the reservoir was low. The tunnel spoil material would be disposed of in the reservoir basin, where it would be shaped. An access road 0.6-mile long would extend from the State highway to the inlet portal. A 7.2/12.5-kV above ground, 3-phase transmission line would be constructed adjacent to the road to furnish power for operation of the control equipment at the portal.

(2) Canals

The Cortez-Towaoc Pipeline would be a buried concrete structure varying in diameter from 15 to 10 inches. The four project



Figure A-9--Aerial view of Dawson Draw Dam and Reservoir site.



Figure A-10---Artist's concept of Dawson Draw Dam and Reservoir.

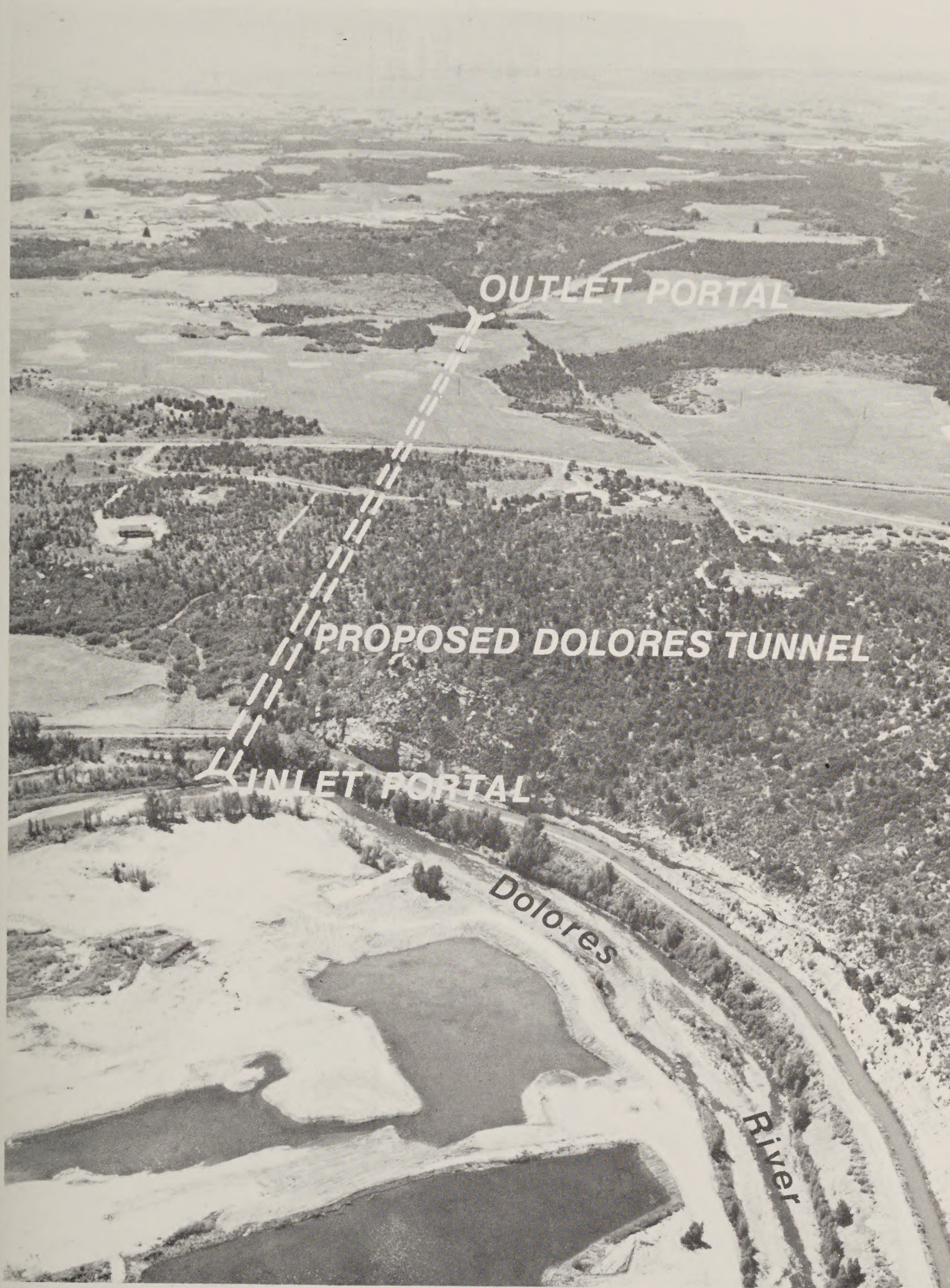


Figure A-11--Proposed alignment of Dolores Tunnel.

Table A-10
Dolores Project canals

Canals	Length (miles)		Initial dimensions			Terminal dimensions		
	Total length	Earth-lined sections	Concrete-lined sections	In-line structures	Water depth (feet)	Water width (feet)	Water depth (feet)	Water width (feet)
Dove Creek Canal	39.5	32.0	3.6	3.9	5.8	41	2.1	9.2
South Canal	7.6	6.0	1.2	.4	4.1	27	2.0	8.8
Dolores Canal	1.3	1.3		(Minor)	5.8	49	3.4	17
Towaoc Canal	45.4	31.8	7.5	6.1	3.4	24	3.3	20
Cortez-Towaoc Pipeline	19.5							
Total	113.3	71.1	12.3	10.4				
1/ Including 19.5 miles of Cortez-Towaoc Pipeline.								
							17.3	2.9

canals would be for the most part earth-lined structures although some sections would be concrete-lined. A number of in-line structures such as siphons, road crossings, bridges, wasteways, and check structures (gates to control canal water level) would also be constructed. Permanent operation and maintenance roads would be located along the canals and would vary in width from 12 to 14 feet. Additional technical information concerning the pipeline and canals is presented in Table A-10.

Rights-of-way along the alignments would vary from 50 to 300 feet, depending on the capacities of the canals. Generally, the width would be approximately 100 feet in addition to the canal and operation and maintenance roads. Construction right-of-way for the Cortez-Towaoc Pipeline would vary in width from 30 to 50 feet. Access to all project lands associated with the canals is adequate; thus, no access roads would be built.

Banks of project canals would be revegetated as wildlife habitat, and fencing would be installed selectively along the right-of-way boundaries of the canals. Barbed wire stock fences with a maximum height of 3.5 feet would be installed along many of the open, earthlined sections of canal. Safety fences 5 to 7 feet high would be installed along chutes in the earth-lined sections, along all of the concrete-lined sections, and around all pipe and drop inlets. In addition an 8-foot protective fence would be placed along a concrete-lined section of the Towaoc Canal in McElmo Creek Canyon. Table A-11 gives a quantified breakdown of the fencing.

Table A-11
Canal fencing
(miles)

	Dove Creek Canal	South Canal	Dolores Canal	Towaoc Canal	Total
Livestock fence	12.1	6.4	0.5	10.3	29.3
Safety fence	.8	.8	.8	7.7	10.1
Protective fence				9.5	9.5

All project canals with the exception of the Dolores Canal would be operated from April to mid-October. The Dolores Canal would be operated year-round so that municipal and industrial water could be delivered to the Cortez-Towaoc Pipeline.

(3) Irrigation Lateral Systems

Approximately 85 miles of pressure pipe laterals would be constructed, consisting of about 65 miles of laterals in the Dove Creek area and about 20 miles of laterals in the Towaoc area. The laterals would be buried about 4 1/2 feet deep. The construction right-of-way along the laterals would be approximately 70 feet in width and would include a total of 718 acres. Although no permanent roads would be constructed along the laterals, permanent easements would be obtained for operation and maintenance. These easements would be 30 feet wide for all laterals and would include 236 acres in the Dove Creek area and 73 acres in the Towaoc area. To permit drainage of the laterals after

the irrigation season, air valves and drain valves would be installed at the high and low points of the systems.

A trashrack would be located at the head of each of the laterals to prevent trash from clogging the pipelines. For added protection, electrically operated water screens would be installed on lateral turnouts in Towaoc area. To furnish power from the Colorado River Storage Project for the screens, a project transmission line would extend 16 1/2 miles from the town of Towaoc to the end of the canal. The line would receive power through an existing local utility. Made of wood, the transmission poles would be 30 to 60 feet high, depending on the terrain, with a single or double cross-arm about 8 feet long. All transmission lines would conform to acceptable standards to protect raptors. Additional information concerning the lateral systems is presented in Table A-12.

Table A-12
Dolores Project laterals

Laterals	Type of structure	Initial capacity (second-foot)	Length (miles)	Irrigated area to be served (acres)
From Dove Creek Canal				
Fairview	Buried pipeline	98	16.6	7,700
Cahone	Buried pipeline	72	12.5	5,680
Cross Canyon	Buried pipeline	20	5.0	1,410
Monument Creek	Buried pipeline	23	3.1	1,640
Subtotal			37.2	16,430
From South Canal				
Pleasant View	Buried pipeline	36	5.3	2,760
Ruin Canyon	Buried pipeline	85	14.7	6,670
Hovenweep	Buried pipeline	28	7.5	2,000
Subtotal			27.5	11,430
From Towaoc Canal				
First lateral	Buried pipeline	13	1.8	697
Second lateral	Buried pipeline	11	2.8	590
Third lateral	Buried pipeline	20	1.5	1,087
Fourth lateral	Buried pipeline	28	4.3	1,703
Fifth lateral	Buried pipeline	53	9.6	3,423
Subtotal			20.0	7,500
Total			84.7	35,360

(4) Pumping Plants

The Great Cut Pumping Plant, occupying an area about 200 feet by 300 feet within a chain link fence, would consist of a concrete building to house the pumping units, a parking area, and a switchyard. Through separate discharge lines at the plant, eight pumping units would deliver water to the Dove Creek Canal each year and two pumping units would deliver water to the "U" Lateral whenever necessary. In the 46-year project operation study, pumping to the lateral was required in 15 years, usually from June through September.

The Great Cut Pumping Plant would be accessible from Colorado Highway 147 by the access road to McPhee Dam. Power for the Great Cut Pumping Plant would be obtained from the Colorado River Storage Project and a new 115-kV overhead line 1 1/2 miles long would be required to connect the existing transmission lines to the pumping plant.

Six pumping plants for the laterals, four along the Dove Creek Canal and two along the South Canal, would pump water into standpipes or elevated steel tanks up to 175 feet in height to provide sprinkler irrigation pressure. The operation of these plants would be fully automated since float levels in the tanks would govern the pump operations. Each site, enclosed by a fence, would be approximately 200 feet by 160 feet and would contain an electrical switchyard to provide power for the plant.

The pumping plants would be located near existing county roads next to the canals, and the only new access roads needed would be at Pleasant View (1/2 mile) and at Ruin Canyon (1/4 mile). Power from the Colorado River Storage Project would be transmitted over the existing 44-kV line of a local utility, and a new overhead line of about 1/2 mile would be needed only for the Pleasant View Pumping Plant. This line would be constructed within the access road right-of-way.

All project pumping plants would be operated from April through mid-October. Table A-13 gives additional data for each of the pumping plants.

Table A-13
Project pumping plants

Pumping plant	No. of units	Maximum flow (second-feet)	Peak electrical capacity (kW)	Average annual energy requirement (kWh)
Great Cut Pumping Plant				
Dove Creek	8	380	5,500	5,800,000
"U" Lateral	2	72	280	99,000
Dove Creek Canal				
Fairview	6	98	2,220	3,500,000
Cahone	6	72	1,550	2,500,000
Cross Canyon	4	20	220	310,000
Monument Creek	4	23	340	480,000
South Canal				
Pleasant View	5	36	700	1,100,000
Ruin Canyon	6	85	1,950	3,000,000

e. Drainage Facilities

Project drainage facilities would be provided for both the Dove Creek and Towaoc areas in locations to be determined on the basis of needs demonstrated during the first years of project operations. Estimates based on a survey of soil characteristics indicate that 24 miles



Figure A-12--Project pumping plants for the lateral systems in the Dove Creek area would be similar to the one shown in the above photograph.

of drains would be required in the Dove Creek area and 51 miles in the Towaoc area. The drains would consist of pipes buried at an average depth of about 7 feet, manholes, and outlet channels. After construction was completed and vegetative cover restored, the portions of the drains above ground would consist of the manholes made of steel or concrete pipe and outlet channels to existing drainageways in the San Juan River Basin.

f. Recreation and Fish and Wildlife Developments

(1) Recreation Developments

Recreational facilities would be constructed at three sites around McPhee Reservoir, as shown in Figure A-17, and would be designed to accommodate an expected use of 186,600 recreation days annually.^{1/} The largest development would be the McPhee Complex, located on the south side of the Great Cut arm of the reservoir and accessible by a new paved road. The facility would contain 100 camping units, 40 picnic units, a scenic overlook, a swimming beach, and a six-lane boat ramp. Parking, electricity, domestic water, and sanitary facilities would also be provided. The Dry Canyon site, a day-use area located on the north side of the reservoir, would include 20 picnic units, parking, a two-lane boat ramp, domestic water, and a sanitary facility. The Hoppe Point Complex, overlooking the reservoir from the north side of McPhee Dam, would include 80 camping units, parking, domestic water, sanitary facilities and a scenic overlook. To allow the most beneficial boating use of the reservoir surface, three zones of use would be defined: (1) high speed boating and water skiing areas, (2) wakeless speed boating areas, and (3) boat fishing areas.

Recreational facilities would be constructed at eight sites along the Dolores River from the dam site to Bedrock, (see Figures A-13 and 14). The facilities would be designed to handle an anticipated use of about 80,500 recreation days annually. The first, located immediately downstream from the dam, would include a boat launching ramp and camping area. The Ferris Canyon and Cabin Canyon recreational sites, located 5 and 9 miles below the dam, would have facilities for fishermen. The Williams Draw site, 11 miles below the dam, would accommodate boat launching and camping. Farther downstream, four additional recreational facilities serving general recreation needs, fishermen, and white-water boaters would be dispersed at 1-day float trip intervals extending approximately 105 miles below McPhee Dam. The facilities at Mountain Sheep Point, Slickrock, Little Gyp Valley, and Bedrock would have picnic areas and launching ramps. Mountain Sheep Point, approximately 25 miles below the dam, would also contain 22 camp sites. All of the sites would include parking, water, and sanitary facilities. Access to the facilities would be over existing and project roads.

In conjunction with the project operations for flood control, reservoir operating criteria would be developed to provide white-water boating flows and to encourage the most effective use of the flows.

^{1/} A recreation day represents use by an individual for any reasonable portion or all of the 24-hour period for recreational activities.

Figure A-13
Dolores River Recreation Facilities
 (Upper River Section)
 Dolores Project, Colo.

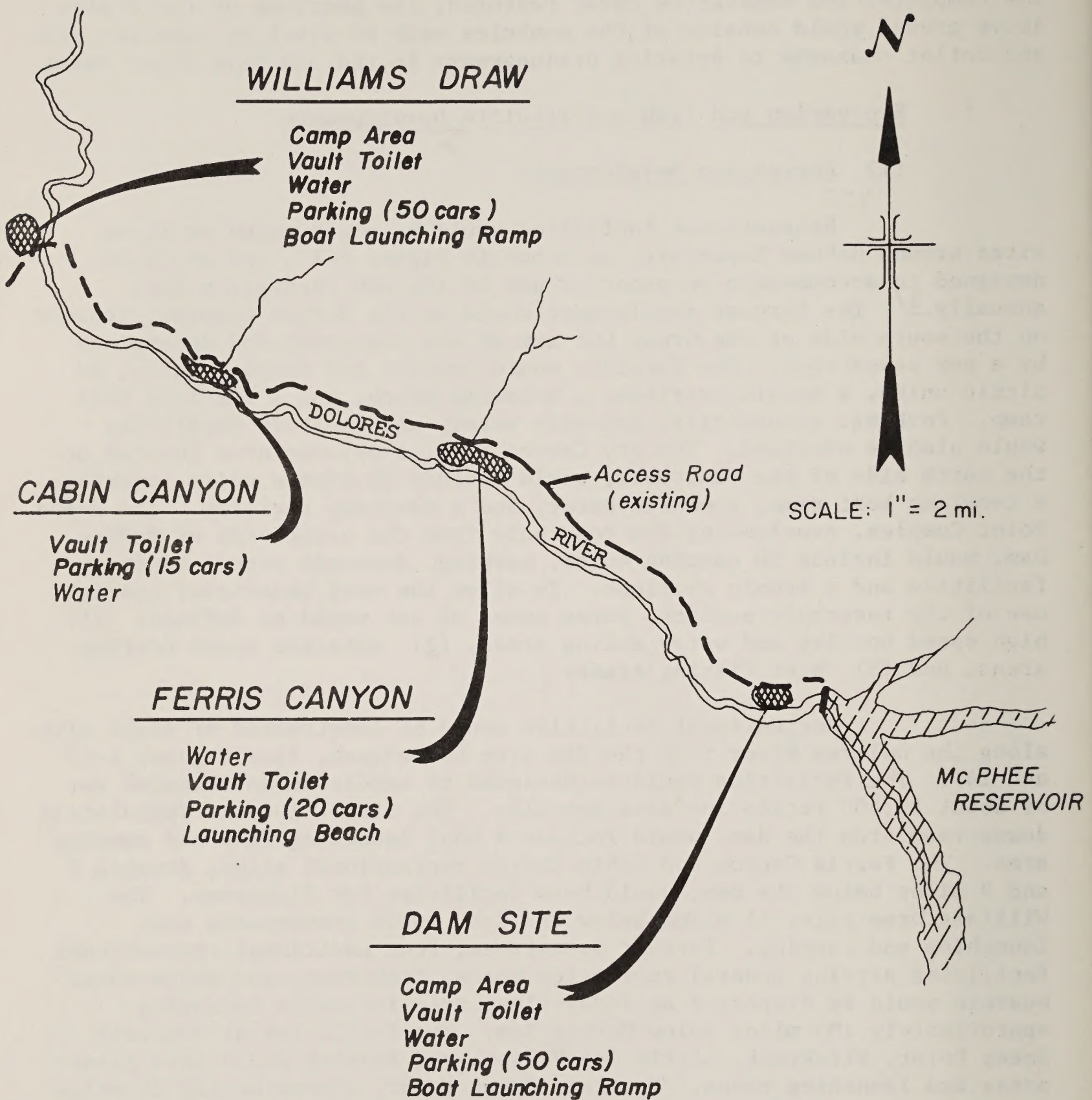
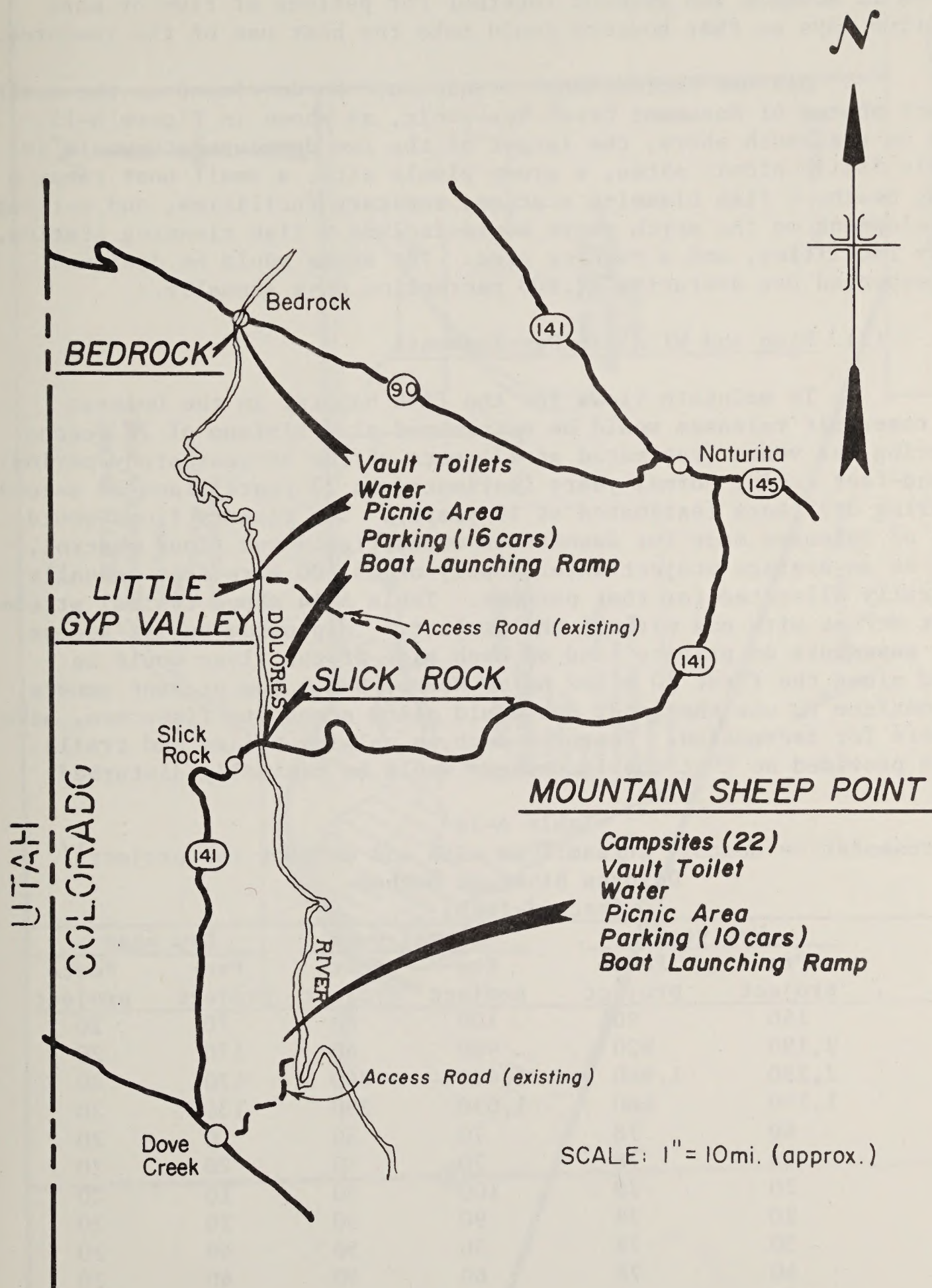


Figure A-14

Dolores River Recreation Facilities
(Lower River Section)
Dolores Project, Colo.



Based on predictions of flood inflows from the high runoff that normally occurs during late April, May, and June, reservoir releases would be made in anticipation of spills. These releases would be scheduled and announced in advance and grouped together for periods of five or more consecutive days so that boaters could make the best use of the resource.

Day-use recreational areas would be developed on the north and south shores of Monument Creek Reservoir, as shown in Figure A-15. Located on the south shore, the larger of the two developments would include six family picnic sites, a group picnic site, a small boat ramp, a swimming beach, a fish cleaning station, sanitary facilities, and parking. The development on the north shore would include a fish cleaning station, sanitary facilities, and a parking area. The areas would be designed for an expected use averaging 22,900 recreation days annually.

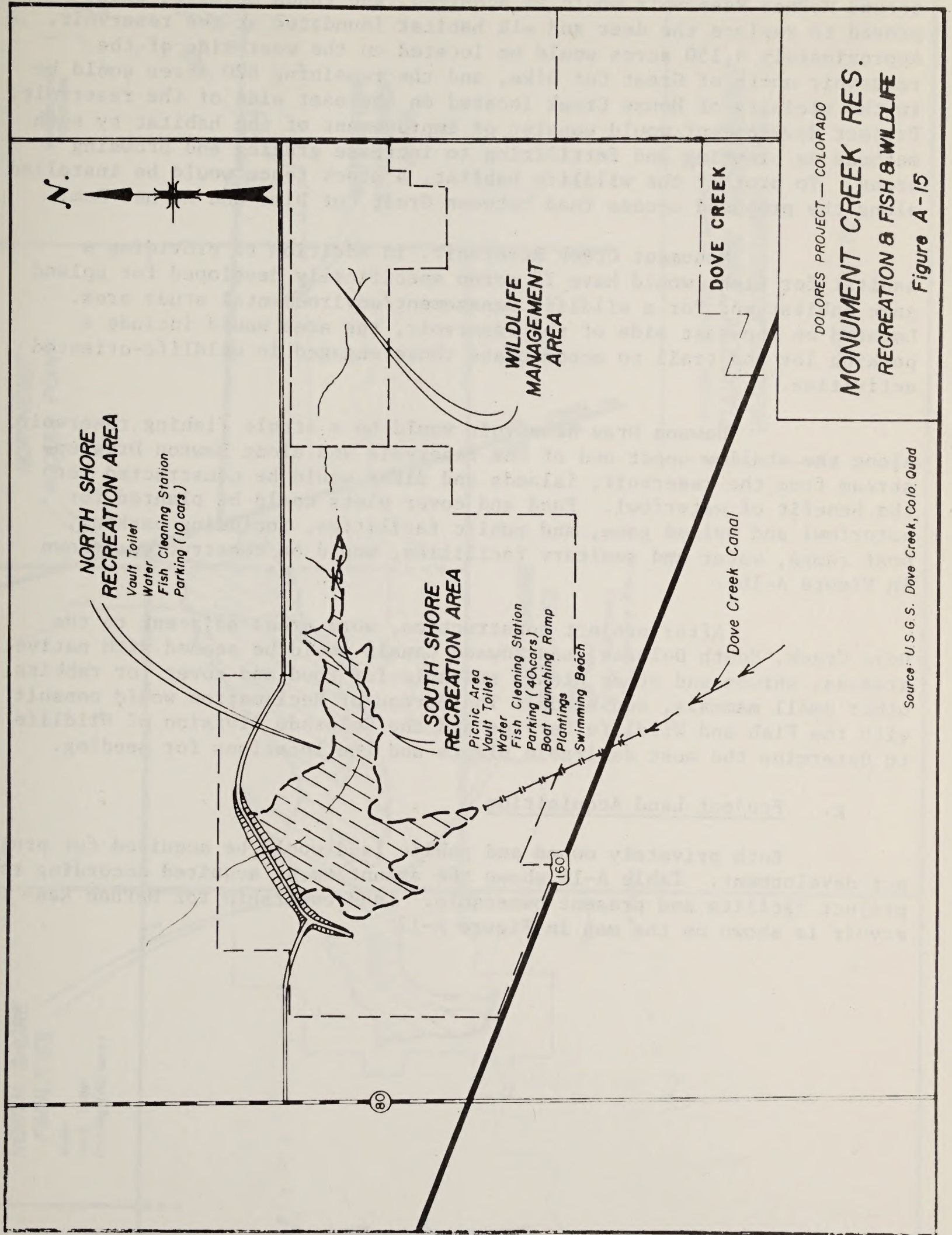
(2) Fish and Wildlife Developments

To maintain flows for the fish habitat in the Dolores River, reservoir releases would be maintained at a minimum of 78 second-feet during wet years (estimated at 13 years of the 46-year study period), 50 second-feet during normal years (estimated at 23 years), and 20 second-feet during dry years (estimated at 10 years). The fishery flows would consist of releases made for downstream water rights and flood control, as well as an average project water supply of 25,400 acre-feet annually specifically allocated for that purpose. Table A-14 shows typical streamflows at McPhee with and without the project. To provide public access, 25-foot easements on private land on each side of the river would be acquired along the first 10 miles below McPhee Dam. The present owners would continue to use the land, but would allow access to fishermen, hikers, and others for recreation. Features such as walking stiles and trails would be provided so that the landowners would be minimally disturbed.

Table A-14
Representative monthly streamflows with and without the project^{1/}
Dolores River at McPhee
(second-feet)

	Wet year		Normal year		Dry year	
	Pre-project	Post-project	Pre-project	Post-project	Pre-project	Post-project
March	140	90	100	60	70	20
April	2,190	920	980	60	170	20
May	2,280	1,940	1,420	240	470	20
June	1,150	460	1,030	290	130	20
July	60	78	70	50	0	20
August	30	78	70	50	20	20
Sept	20	78	100	50	10	20
Oct	20	78	90	50	20	20
Nov	30	78	50	50	40	20
Dec	40	78	60	50	40	20
Jan	40	78	50	50	50	20
Feb	50	78	60	50	50	20

^{1/} The flows in excess of minimum releases that are shown for some spring and summer months indicate that additional releases would have been made at some time during those months in anticipation of snowmelt inflow.



As part of the project, 4,770 acres of land or land rights around McPhee Reservoir would be acquired, and lands acquired would be improved to replace the deer and elk habitat inundated at the reservoir. Approximately 4,150 acres would be located on the west side of the reservoir north of Great Cut Dike, and the remaining 620 acres would be in the vicinity of House Creek located on the east side of the reservoir. Project development would consist of improvement of the habitat by such methods as planting and fertilizing to increase grazing and browsing areas. To protect the wildlife habitat, a stock fence would be installed along the proposed access road between Great Cut Dike and McPhee Dam.

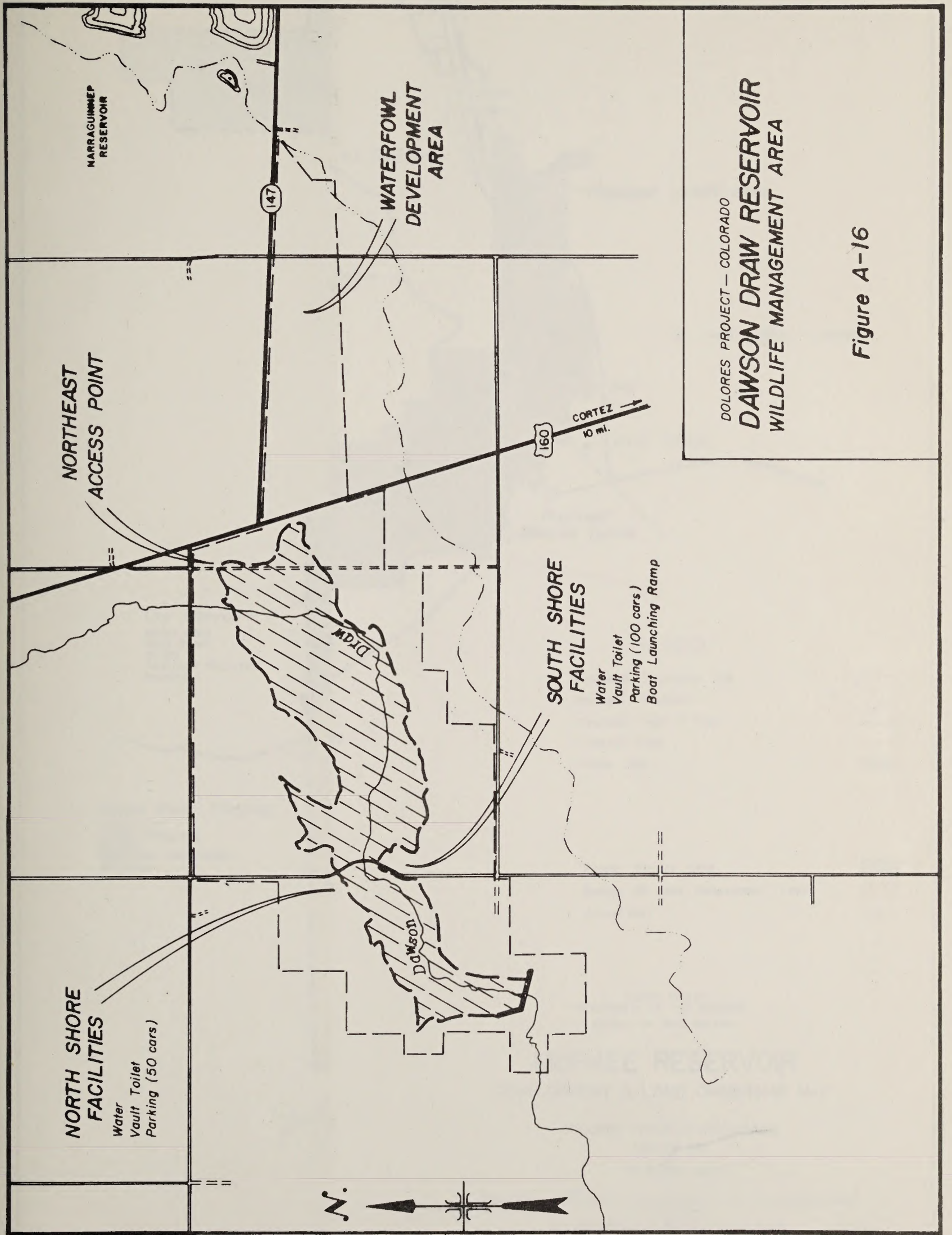
Monument Creek Reservoir, in addition to providing a habitat for fish, would have 75 acres specifically developed for upland game habitat and for a wildlife management/environmental study area. Located on the east side of the reservoir, the area would include a parking lot and trail to accommodate those engaged in wildlife-oriented activities.

Dawson Draw Reservoir would be a stable fishing reservoir. Along the shallow upper end of the reservoir and along Dawson Draw upstream from the reservoir, islands and dikes would be constructed for the benefit of waterfowl. Food and cover plots would be planted for waterfowl and upland game, and public facilities, including parking, boat ramps, water and sanitary facilities, would be constructed (shown in Figure A-16).

After project construction, work areas adjacent to the Dove Creek, South Dolores, and Towaoc Canals would be seeded with native grasses, shrubs and other plants suitable for food and cover for rabbits, other small mammals, and birds. The Bureau of Reclamation would consult with the Fish and Wildlife Service and the Colorado Division of Wildlife to determine the most desirable plants and the locations for seeding.

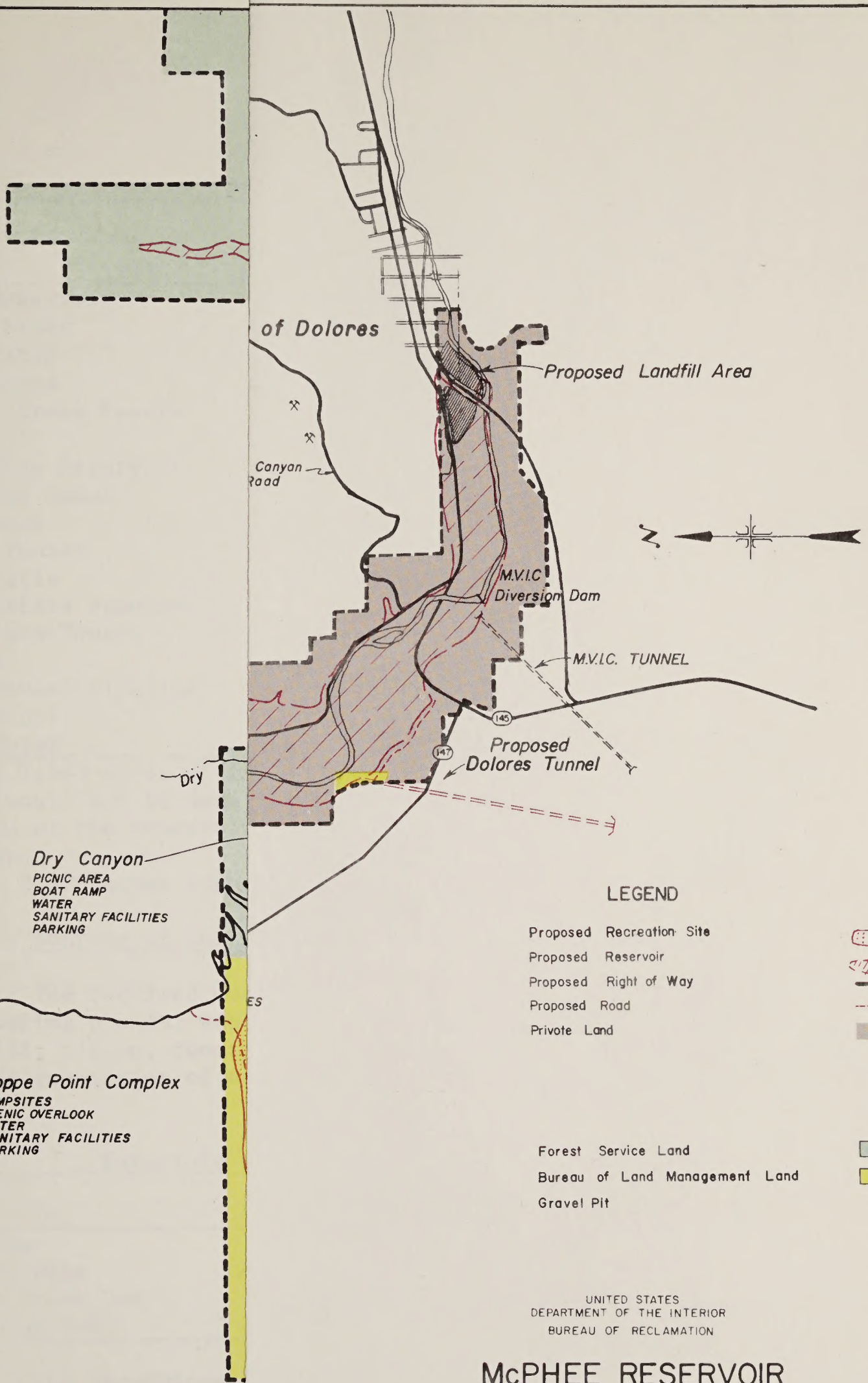
g. Project Land Acquisition

Both privately owned and public land would be acquired for project development. Table A-15 shows the amount to be acquired according to project facility and present ownership. Land ownership for McPhee Reservoir is shown on the map in Figure A-17.



DOLORES PROJECT — COLORADO
DAWSON DRAW RESERVOIR
WILDLIFE MANAGEMENT AREA

Figure A-16



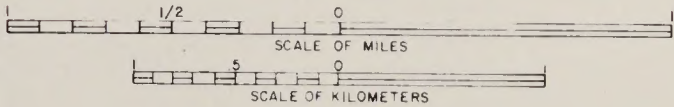
UNITED STATES
 DEPARTMENT OF THE INTERIOR
 BUREAU OF RECLAMATION

McPHEE RESERVOIR

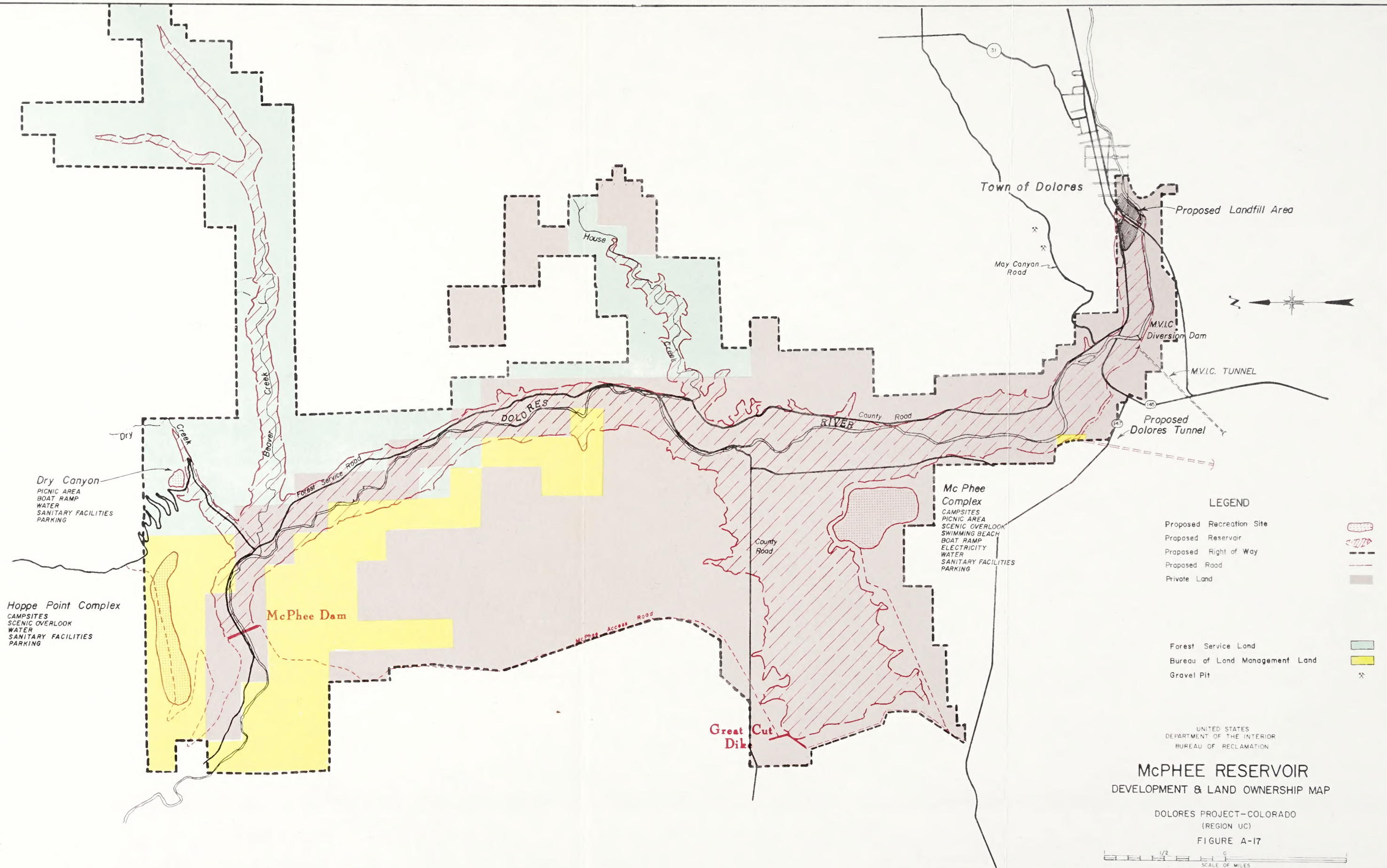
DEVELOPMENT & LAND OWNERSHIP MAP

DOLORES PROJECT-COLORADO
 (REGION UC)

FIGURE A-17



DECEMBER 1976



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McPHEE RESERVOIR
 DEVELOPMENT & LAND OWNERSHIP MAP

DOLORES PROJECT-COLORADO
 (REGION UC)

FIGURE A-17

SCALE OF MILES
 SCALE OF KILOMETERS

DECEMBER 1976

Table A-15
Project land acquisition

	Bureau of Land Management	Forest Service	Indian	Private	Total
McPhee Reservoir	<u>1</u> /2,282	<u>2</u> /3,830		9,162	15,274
Dolores River					
Fee title		60		18	78
Easements				57	57
Monument Creek Reser- voir				372	372
Dawson Draw Reservoir				1,072	1,072
Dove Creek Canal				483	483
South Canal				95	95
Dolores Tunnel					
Fee title				3	3
Subsurface easement				4	4
Dolores and Towaoc canals	50		272	428	750
Cortez-Towaoc Pipeline (easement)			13	58	71
Total	2,332	3,890	285	11,752	18,259

1/ 1,365 acres of the public land has been withdrawn, ensuring that it would not be developed for any use inconsistent with the construction of the reservoir. The remaining 917 acres would also be withdrawn.

2/ 3,520 acres withdrawn; 310 acres to be withdrawn.

h. Sources of Construction Materials

The required construction materials for building the dams, dike, pumping plants, and canals would include impervious and pervious earth fill, riprap, concrete aggregate, and ready-mix concrete. Table A-16 lists the quantities of materials, required for the dams and dike.

Table A-16
Materials required for project structures

	Quantity (cubic yards)		
	Impervious	Pervious	Riprap
McPhee Dam	2,100,000	2,900,000	29,000
Great Cut Dike	170,000	8,000	11,000
Monument Creek Dam	135,000	8,500	8,500
Dawson Draw Dam	92,000	7,500	6,500

The impervious material for Monument Creek and Dawson Draw Dams would be available below the maximum water level of each reservoir. Impervious material for McPhee Dam and Great Cut Dike would be obtained from a proposed borrow area of 550 to 600 acres located immediately north of the Great Cut arm of the reservoir (as shown in Figure A-18).

The use of this area would be necessary because no suitable material has been found within the water line of the reservoir. No impervious material would be required for the Dolores landfill. The impervious material required for the Dove Creek, South, Dolores and Towaoc Canals would be found along the canal alignments. The Towaoc Canal, however, might need supplemental materials hauled in from other sections of the canal right-of-way. All borrow areas would be shaped to conform to the surrounding terrain and those outside the reservoir basins would also be covered with topsoil and seeded.

The pervious material used to construct the dams, dikes, and the Dolores landfill, as well as the concrete aggregate used in building all project facilities, would come from within McPhee Reservoir basin. The riprap sources for all facilities could come from the Dakota Sandstone found along the Dolores River Canyon above and below the maximum water level of McPhee Reservoir, approximately 5 miles upstream from the dam site. The ready-mix concrete used to construct the pumping plants and other project facilities would come from local plants at Dolores and Cortez.

Materials such as cement, pipe, steel gages and structures, pumps, electric motors, and operating and control equipment would most likely be manufactured or processed outside the project area. The materials would be hauled to the construction sites by truck or rail.

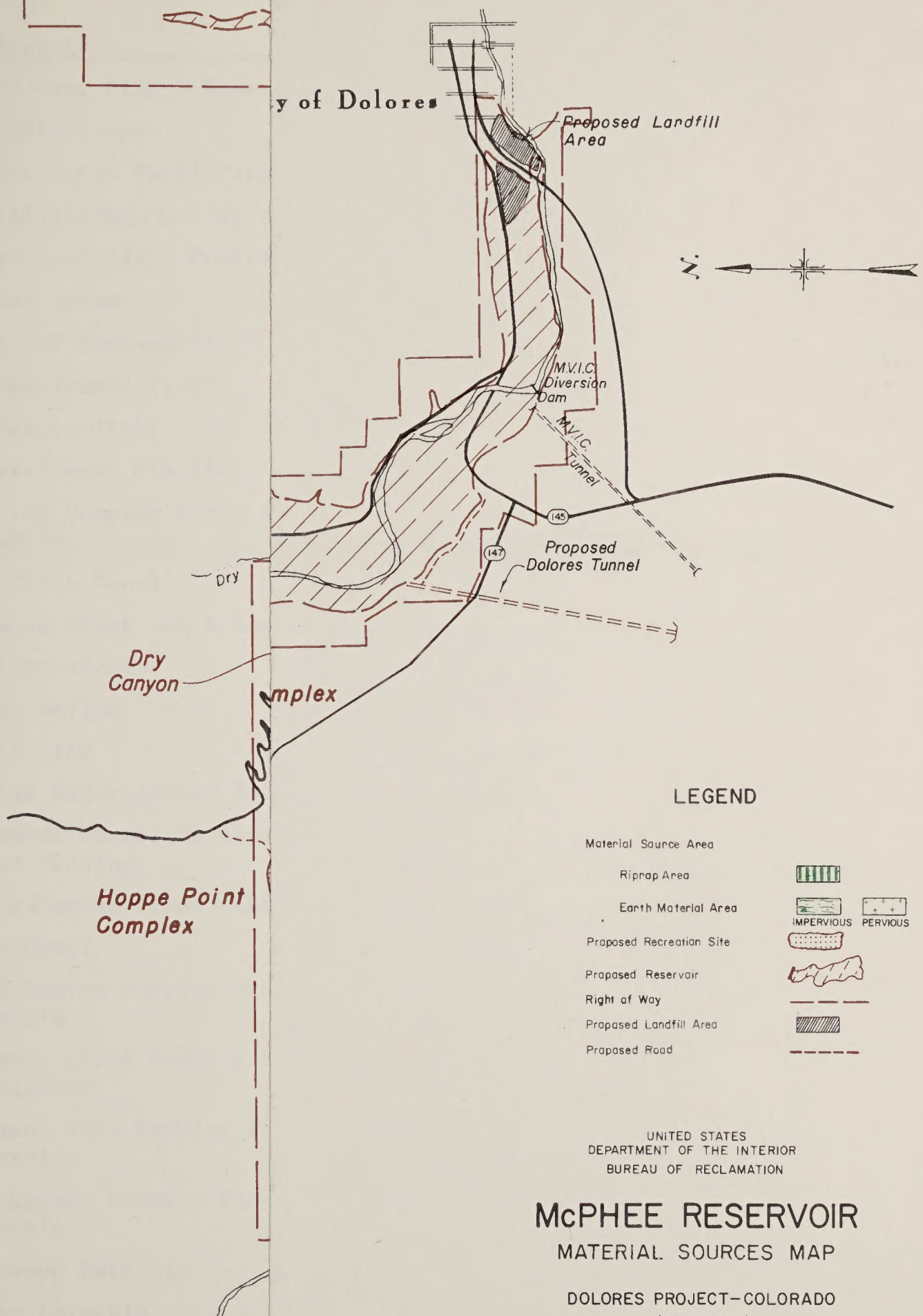
i. Construction Headquarters and Program

Construction of the Dolores Project would be supervised from a construction office located in the vicinity of Cortez. Temporary field offices and construction shops would be required at McPhee Dam; Great Cut Dike and Pumping Plant; Monument Creek Dam; Dawson Draw Dam; along the Dove Creek, South, and Towaoc Canals; and at each of the principal sprinkler pumping plants and lateral areas.

The construction of the project would take 9 years (see Figure A-19). During the peak year, the project would provide approximately 1,300 jobs of work for private and government employees, with a total of approximately 6,270 jobs over the 9-year period. These estimates are based upon full-time employment during a 9-month construction season.

j. Administration, Operation and Maintenance

The Dolores Water Conservancy District would be the general administrator of the project facilities associated with the Dove Creek Canal, South Canal, and Monument Creek Reservoir. It would also be the general administrator of the joint facilities of the project, including McPhee Dam and Reservoir, Great Cut Dike and Pumping Plant, the Dolores Tunnel and Canal, and the Cortez-Towaoc pipeline as far as Cortez. The Ute Mountain Ute Indian Tribe would administer the Towaoc Canal, the irrigation facilities on the reservation, and the pipeline from Cortez to its facilities at Towaoc.



LEGEND

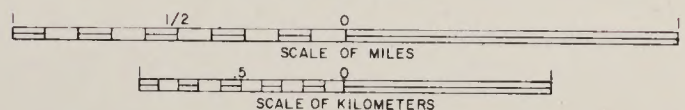
- Material Source Area
- Riprap Area
- Earth Material Area
- Proposed Recreation Site
- Proposed Reservoir
- Right of Way
- Proposed Landfill Area
- Proposed Road

UNITED STATES
DEPARTMENT OF THE INTERIOR
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McPHEE RESERVOIR MATERIAL SOURCES MAP

DOLORES PROJECT-COLORADO
(REGION UC)

FIGURE A-18



DECEMBER 1976

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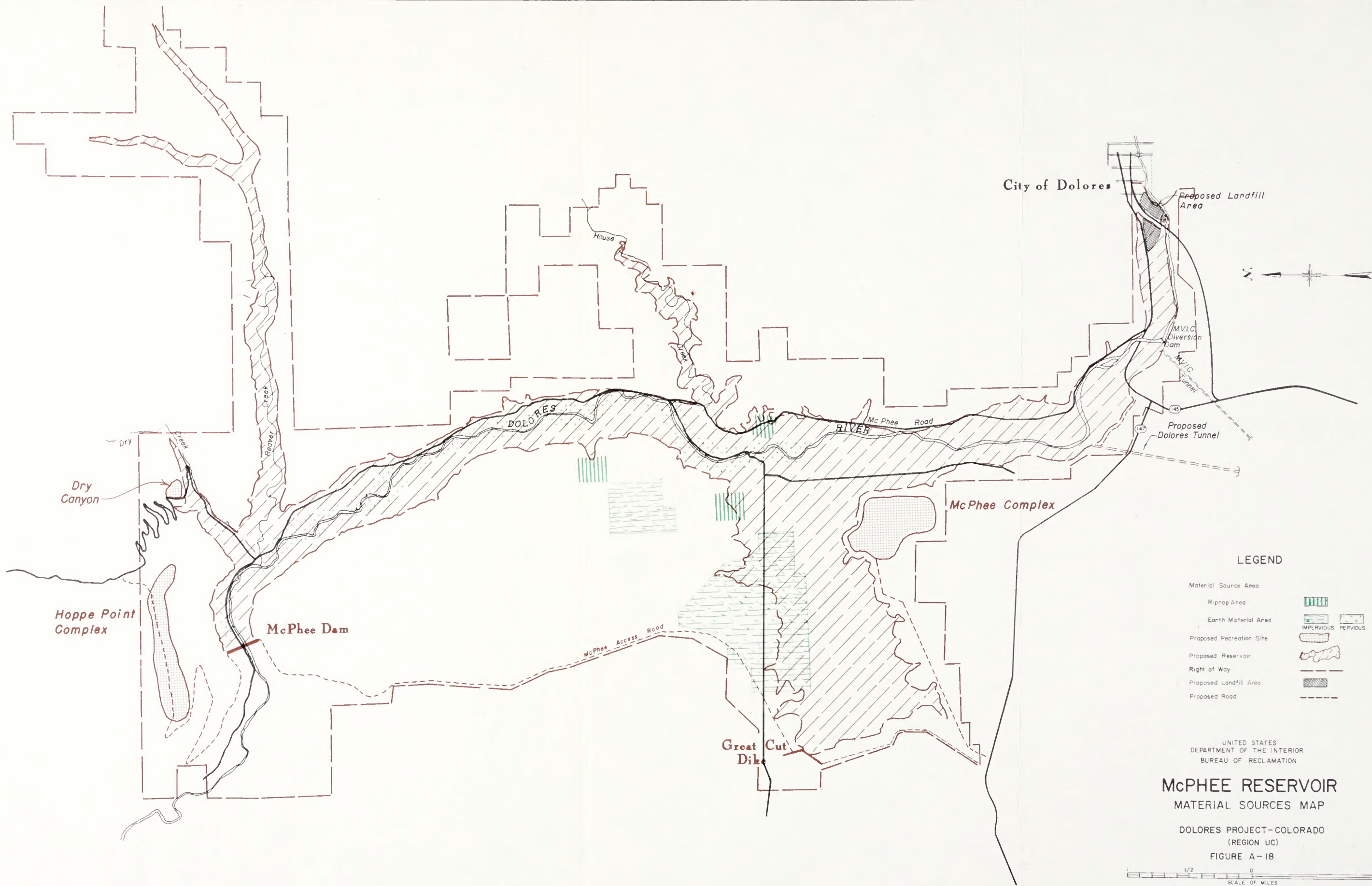
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LEGEND

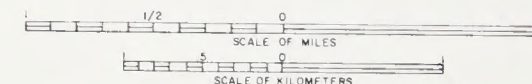
- Material Source Area
- Riprap Area
- Earth Material Area
- Proposed Recreation Site
- Proposed Reservoir
- Right of Way
- Proposed Landfill Area
- Proposed Road

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McPHEE RESERVOIR MATERIAL SOURCES MAP

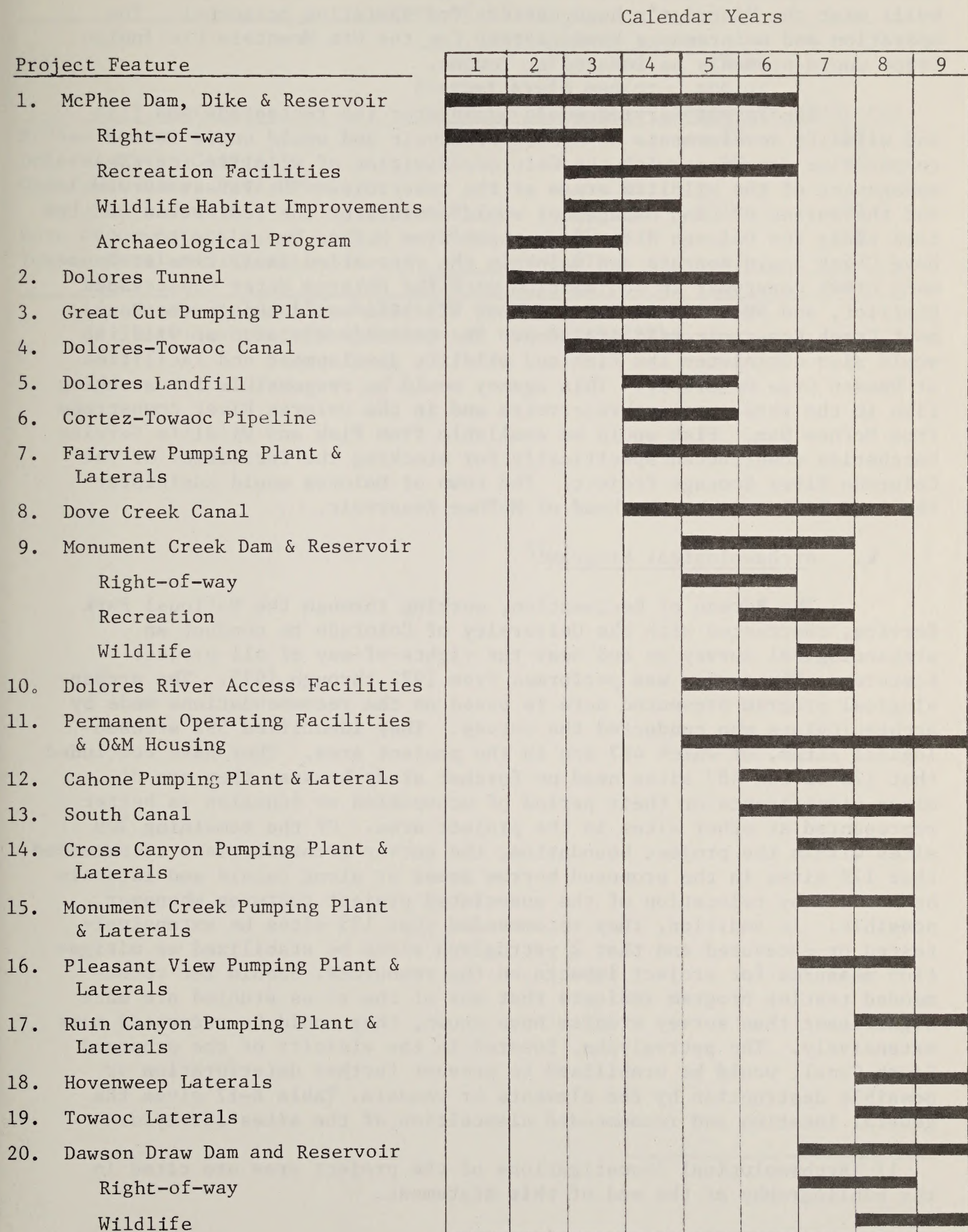
DOLORES PROJECT-COLORADO
(REGION UC)

FIGURE A-18



DECEMBER 1976

Figure A-19
Proposed construction schedule



The headquarters of the Dolores Water Conservancy District would be located at the Great Cut Pumping Plant. Three houses would be built near the District's headquarters for operating personnel. The operation and maintenance headquarters for the Ute Mountain Ute Indian Tribe would probably be located at Towaoc.

The Forest Service would administer the recreation and fish and wildlife developments at McPhee Reservoir and would enter into a cooperative agreement with the Colorado Division of Wildlife for the management of the wildlife areas at the reservoir. The Forest Service and the Bureau of Land Management would administer the recreation facilities along the Dolores River downstream from McPhee Dam. The town of Dove Creek would operate and maintain the recreation facilities at Monument Creek Reservoir in conjunction with the Dolores Water Conservancy District, and the Colorado Division of Wildlife would manage the Monument Creek Reservoir wildlife area. The Colorado Division of Wildlife would also administer the fish and wildlife development and facilities at Dawson Draw Reservoir. This agency would be responsible for stocking fish in the three project reservoirs and in the Dolores River downstream from McPhee Dam. Fish would be available from Fish and Wildlife Service hatcheries constructed specifically for stocking the facilities of the Colorado River Storage Project. The town of Dolores would administer the land fill area at the head of McPhee Reservoir.

k. Archaeological Program^{1/}

The Bureau of Reclamation, working through the National Park Service, contracted with the University of Colorado to conduct an archaeological survey on and near the rights-of-way of all project features. The survey was performed from 1972 through 1975. The archaeological program presented here is based on the recommendations made by archaeologists who conducted the survey. They identified 592 archaeological sites, of which 487 are in the project area. They have concluded that 178 of the 487 sites need no further study because they are of minor significance or their period of occupation or function is better represented at other sites in the project area. Of the remaining 309 sites within the project boundaries, the survey archaeologists recommended that 172 sites in the proposed borrow areas or along canals and laterals be avoided by relocation of the associated project features whenever possible. In addition, they recommended that 135 sites be extensively tested or excavated and that 2 petroglyph sites be stabilized as mitigation measures for project impacts on the resources. Should the recommended testing program indicate that any of the sites studied are more significant than survey studies have shown, they could be excavated more extensively. The petroglyphs, located in the vicinity of the proposed South Canal, would be stabilized to prevent further deterioration or possible destruction by the elements or vandals. Table A-17 gives the general location and recommended disposition of the sites surveyed.

^{1/} Archaeological investigations of the project area are cited in the bibliography at the end of this statement.

Table A-17
Proposed archaeological program
(number of sites)

Feature	Surveillance			Subtotal
	No further work	Flag and avoid and/or reroute	Test and/or excavate	
McPhee Reservoir	58	28	69	155
Dolores River Canyon ^{1/}	22		18	40
Great Cut Dike, Dove Creek, and South Canals	58	13	^{2/} 16	87
Dove Creek Laterals	31	80	17	128
Towaoc Canal and Laterals	9	51	17	77
Total	178	172	137	487

^{1/} To about 10 miles below the proposed McPhee Dam site.

^{2/} Includes the stabilization of two petroglyphs.

CHAPTER B

DESCRIPTION OF THE ENVIRONMENT

B. DESCRIPTION OF THE ENVIRONMENT

1. Climate^{1/}

The climate of the project area is essentially semiarid and is characterized by low precipitation and humidity, abundant sunshine, a fairly large daily temperature range, and moderate westerly winds. As a result of topographic changes, the local climate exhibits large variations within short distances, with increases in precipitation and decreases in temperature from southwest to northeast.

Average annual precipitation varies from less than 10 inches in the southwestern corner of the area to about 20 inches in the northeast. Precipitation varies considerably from year to year, but on the average June is the driest part of the year and July through October is the wettest. The remaining months are fairly uniform. Afternoon showers commonly occur during July through mid-September, occasionally reaching thunderstorm intensity. Damaging storms and other severe weather conditions are infrequent.

The typically clear skies and high solar radiation, combined with the elevation of the area, result in warm days and cool nights during the spring, summer, and fall. The days are also comfortably warm during the winter, but the nights are quite cold. Maximum daytime temperatures vary from about 32-40° F. in January to 80-90° F. in July, with corresponding nighttime minimums ranging from nearly 0° F. to around 50° F. Extreme high temperatures of over 100° F. have been recorded twice in Cortez, and extreme low temperatures have dropped below -25° F. The frost-free period varies from about 100 to 120 days in the Dove Creek area and about 130 to 140 days in the Montezuma Valley and Towaoc areas.

2. Air Quality

According to the Colorado Department of Health, Montezuma and Dolores Counties meet the Federal particulate standards for air quality.^{2/} The Federal primary standards for suspended particulates are averages of 260 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) over a 24-hour period or 75 $\mu\text{g}/\text{m}^3$ over a 1-year period. The secondary standard is a 24-hour average of 150 $\mu\text{g}/\text{m}^3$ (geometric). As Table B-1 shows, the annual mean concentrations of the two counties meet the standard.

^{1/} Joseph W. Berry, "The Climate of Colorado," Climates of the States: Volume II--Western States, Including Alaska and Hawaii, ed. National Oceanic and Atmospheric Administration, U.S. Department of Commerce (Port Washington, N.Y.: Water Information Center, Inc., 1974), pp. 595-612.

^{2/} Colorado Department of Health, Air Pollution Control Commission, Annual Progress Report, 1975.

Table B-1
Suspended particulates, 1974
Montezuma and Dolores Counties
(ug/m³)

Monitor location	Quarterly geometric means				Annual geometric		
	1st	2nd	3rd	4th	Mean	High	Low
Cortez	39*	**	46	***	44	133	18
Mesa Verde	8	19	16	8	12	82	2

* = average based on limited data

** = insufficient data

*** = no samples

Both counties are rural, with few industries to affect air quality, and wood waste-disposal burners and open-burning disposal areas are presently the major sources of suspended particulates. Although coal-fired power generation facilities are located in New Mexico about 40 miles south of Cortez, meteorological and monitoring studies have shown practically no pollutants from this region entering southwestern Colorado. The Department of Health predicts that air quality for the counties will continue to meet Federal particulate standards. Factors influencing this trend include favorable climate, low population density, enforcement of Colorado regulations, and continued intergovernmental coordination with neighboring states.

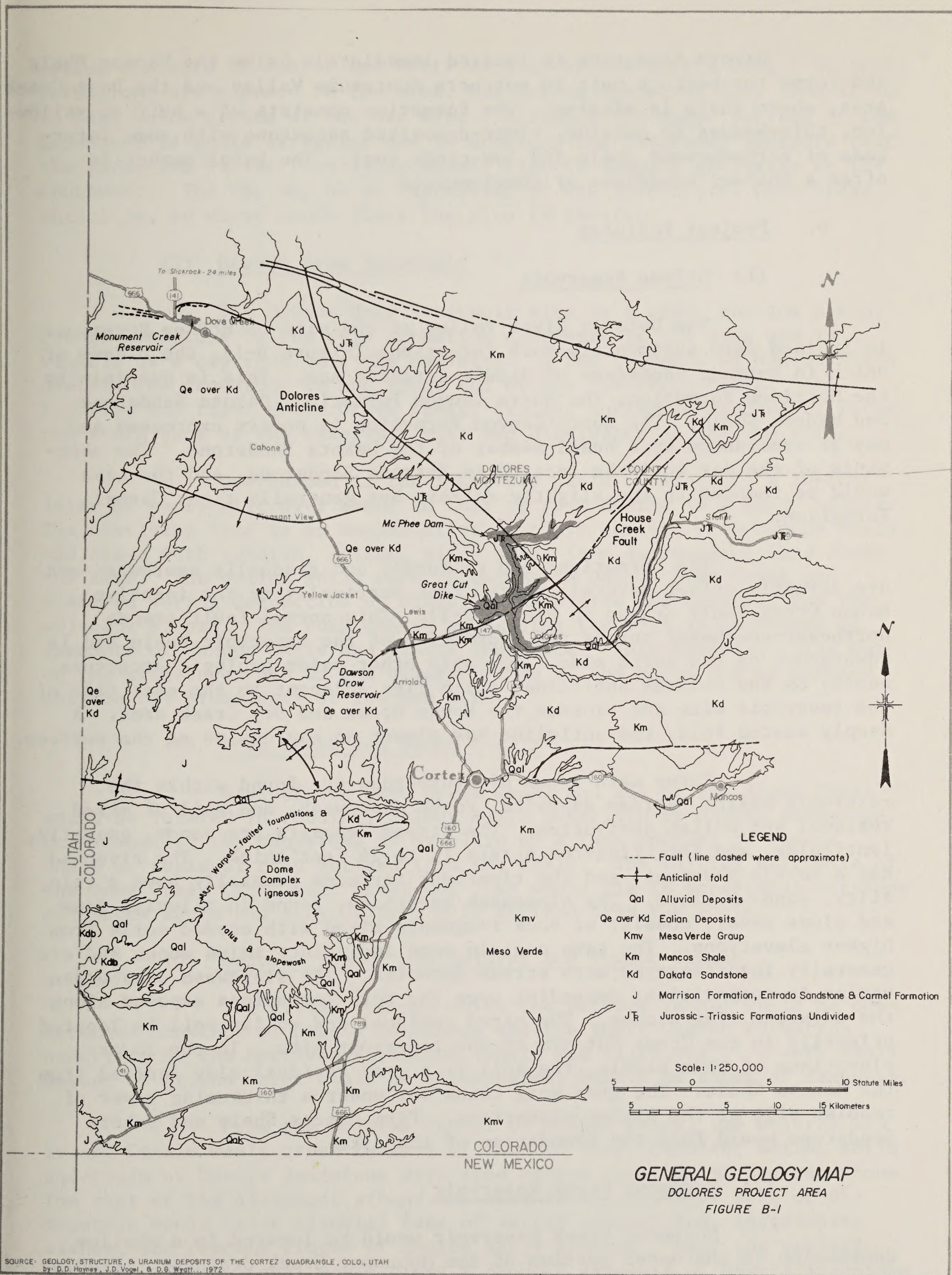
3. Geology

a. General

The project area, lying within the eastern portion of the Colorado Plateau physiographic province, has flat-lying or gently warped sedimentary formations that have eroded to form long shale slopes, prominent sandstone cliffs, and steep-walled canyons.^{1/} Prominent physiographic features are Mesa Verde, which rises to an elevation of about 8,400 feet on the east side of Montezuma Valley; Ute Mountain, which rises to an elevation of about 10,000 feet to the west of the valley; and the Dolores River Canyon. North and northwest of Cortez the project area consists of a high rolling plain with gently sloping hills, dissecting streams, and occasional steep-walled canyons. South of Cortez the area has deeply incised arroyos, overlapping alluvial fans, and remnant hills above the valley floor. Elevations decrease from 6,950 feet in the Dove Creek area to 5,000 feet near Towaoc.

Figure B-1 illustrates the geology and formation boundaries of the project area. Five sedimentary units are important within the project area, two of which underlie the projects lands and all are found along McPhee Reservoir. Underlying southern Montezuma Valley and the Towaoc area is Mancos Shale, a gray to black, fossiliferous, brackish, nearly impervious marine formation with some minor sandstone interbeds. In Montezuma Valley the shale is highly fragmented. The upper zone of the formation is nearly always weathered and easily eroded, expressing a low, rounded topography.

^{1/} Nevin M. Fenneman, Physiography of Western United States (New York: McGraw-Hill, 1931).



Dakota Sandstone is located immediately below the Mancos Shale and forms the bedrock unit in northern Montezuma Valley and the Dove Creek area, where shale is missing. The formation consists of a buff to yellowish, thin-bedded to massive, river-deposited sandstone with some interbeds of carbonaceous shale and low grade coal. The basal member is often a coarser sandstone or conglomerate.

b. Project Features

(1) McPhee Reservoir

The Dolores River Valley at the site of McPhee Reservoir is incised into sedimentary rock formations (Figure B-1), the oldest of which is Entrada Sandstone of Middle Jurassic Age. This is overlain by the Morrison Formation, the Burro Canyon Formation, Dakota Sandstone, and Mancos Shale. The Burro Canyon Formation is poorly expressed and may be considered as a basal member of the Dakota Sandstone. The abutments of the dam would be located in Entrada Sandstone, and the base would be founded in the slightly softer, but generally tight Carmel Formation.

The formations dip uniformly and gradually southward and are abruptly offset several hundred feet vertically by the inactive House Creek Fault (shown on Figure B-1). This normal fault trends northeast-southwest across the midportion of the reservoir basin and is downthrown on the north side. The only other major geologic structure nearby is the Dolores anticline, which lies adjacent to the east side of the reservoir site and crosses the House Creek and Dry Creek arms. A deeply seated fold, the anticline has almost no expression at the surface.

Three main types of overburden are found within the reservoir basin: stream deposits, rocky slopewash, and soil of mixed residual and eolian derivation. The stream deposits are sandy, gravelly, lenticular, and interfingered strata 15 to 24 feet thick. The riverbed has a cobble pavement, and the riverbank terraces generally have a thin, silty, sandy surface. The slopewash materials, found in alluvial fans and slope cover, consist of rock fragments mixed with eroded soils from higher elevations. The fans contain some indistinct talus zones and are generally interfingered with stream deposits. The slopewash overburden varies in composition, depending upon the rock formations exposed along the adjacent side slopes. The mixed residual and eolian soil is located primarily in the Great Cut arm of the reservoir site. In the lower elevations of this saddle, the soil is a gray residual clay derived from the Mancos Shale. The gray soil thins out under a thickening cover of reddish silt at the higher elevations. Firm Mancos Shale and Dakota Sandstone would form the foundation of the dike.

(2) Monument Creek Reservoir

Monument Creek Reservoir would be located in a shallow depression in the upper portion of the Monument Creek drainage. Reddish

eolian deposits of clayey and silty sand cover the entire site. No rock formations are exposed in the area, but Dakota Sandstone lies from 10 to 15 feet below ground at the dam site. Although the upper surface of the sandstone is quite irregular due to erosion, the interbeds indicate that the formation varies from lying nearly flat to dipping gradually to the southwest. The dip may be an expression of the deep-seated Dove Creek anticline, on whose south flank the site is located.

(3) Dawson Draw Reservoir

The Dawson Draw Reservoir site is a wide, shallow basin. Dakota Sandstone is the only formation expressed in the area and is visible as a cap rock near the dam site. A few remnants of Mancos Shale overlie the sandstone in the upper end of the reservoir basin. The inactive and tight House Creek Fault, tracing northeast-southwest, forms the south bank of the reservoir site and dissipates at the dam site.

Overburden in the reservoir basin consists of a 10-foot layer of sandy silt over about 10 feet of rock debris in a sandy matrix. The overlying silt is an accumulation of clays derived from Mancos Shale and mixed with reddish, eolian, silty sands from surrounding land above the site. The eolian soils were deposited in Dawson Draw Creek and modified during deposition by windblown particles and outwash from the adjacent slopes. The rock debris underlying the soil is comprised of remnants of Mancos Shale and Dakota Sandstone. This material thins out on the sideslopes and in the upper portion of the basin and is exposed only on the sideslopes at the dam site.

(4) Dove Creek and South Canals

Most of the Dove Creek Canal and all of the South Canal would be located in reddish, eolian soils underlain by Dakota Sandstone. Occasionally, the sandstone is overlain by a thin remnant of Mancos Shale or residual clay derived from the shale. The initial half mile of the Dove Creek Canal near Great Cut Dike would lie in occasional outcrops of Mancos Shale and gray, clayey soil derived from the shale.

(5) Dolores Tunnel and Dolores and Towaoc Canals

The divide through which the Dolores Tunnel would be constructed consists of Dakota Sandstone and the Burro Canyon Formation underlain by the Morrison Formation (shale and siltstone). A very small amount of ground water would be encountered, mostly as zones of dampness.

From the Dolores Tunnel to McElmo Creek, the Dolores and Towaoc Canals would cross reaches of thin to deep, reddish, eolian soils underlain by Dakota Sandstone with some barren outcrops of the sandstone. The rest of the alignment around the eastern and southern base of Ute Mountain would cross alluvial fans of varied composition, intervening washes, and remnant ridges of Mancos Shale bedrock. Near the project land, the Towaoc Canal would cross a denuded exposure of Dakota Sandstone and terminate on a coarse fan.

c. Mineral Resources

A large sand and gravel industry has been operating within the McPhee Reservoir basin since 1946. According to the U.S. Bureau of Mines, small amounts of gold and magnetite (a common form of iron) are found in the sand and gravel beds.^{1/} Both these minerals originated near the headwaters of the river in the Rico Mountains.

The Morrison Formation, a known uranium producer to the north and west of the project area, crops out within the reservoir basin. No economic deposits from the formation have been found or are expected to be found in the area, and mining claims do not show any evidence of recent activity. The Shinarump and Chinle Formations at depth beneath the Monument Creek Reservoir site may contain commercial uranium deposits, but the possibility is slight. Although the Ute Mountain Ute Indian Tribe has entered into a lease with an oil company for exploration and possible mining of uranium ore and associated minerals on the reservation, the results from the exploration are not yet available.

The Paradox Formation beneath the Monument Creek Reservoir site is known to contain extensive reserves of sodium chloride, but they are over 6,000 feet deep. Because of extensive reserves elsewhere that are closer to the surface, they have no present value.

Major reserves of coal are located in the Durango-Gallup coal field, whose northern border is approximately 8 miles south of Dolores. The coal is found in the Dakota Sandstone and the Menefee and Fruitland Formations. Shaley zones of Dakota Sandstone outside the McPhee Reservoir site contain thin seams of poor quality lignite coal, and the sandstone at the Monument Creek and Dawson Draw Reservoir sites may contain some subbituminous coal. Exploratory drilling by the Bureau of Reclamation encountered coal at the sites of Monument Creek and Dawson Draw Dams, but in both cases the coal was generally low-grade, sub-bituminous, shaley. Areas where coal may be economically strippable in the future have been identified as mineral resource areas and designated as areas of Colorado State concern by Montezuma County, under the provisions of Colorado State House Bill 1041. These areas include the Great Cut Arm of McPhee Reservoir, the southern half of the wildlife mitigation area on the west side of the reservoir, and land immediately surrounding the reservoir on the north, west, and south.

Five oil and gas wells have been drilled in the vicinity of McPhee, and three wells have been drilled in the vicinity of Monument Creek Reservoir. No oil and gas was recorded in any of these holes, and all are considered to be dry and abandoned. A natural gas storage well in the McPhee Reservoir basin is served by a 2-inch pipeline.

^{1/} C. M. Harrer, Mineral Resources at McPhee Reservoir Site, Dolores Project, Montezuma County, Colorado (Bureau of Mines, August 1958). Bureau of Mines, Intermountain Field Operations Center, Denver, Colo., letter to Bureau of Reclamation, Durango, Colo. (July 14, 1975).

d. Seismicity

The Dolores Project would be located in a zone of minimal seismic risk where only minor damage could be expected from earthquakes.^{1/} No known epicenters are within the area, but tremors from other areas may be felt. According to the National Geophysical and Solar-Terrestrial Data Center, the recorded magnitudes of earthquakes within a 100-mile radius of Cortez range from about 3.4 to 5.5 on the Richter Scale and average about 4.^{2/} Recorded intensities on the modified Mercalli Scale are, in most cases, IV (usually no real damages). The last tremor felt, in January 1976, was of minor magnitude and occurred as a result of the removal of petroleum and gas from formations and their subsequent settling. The epicenter was located about 100 miles south of Cortez. All recorded earthquake activity within a 100-mile radius of McPhee Damsite was considered and is shown in Figure B-2.

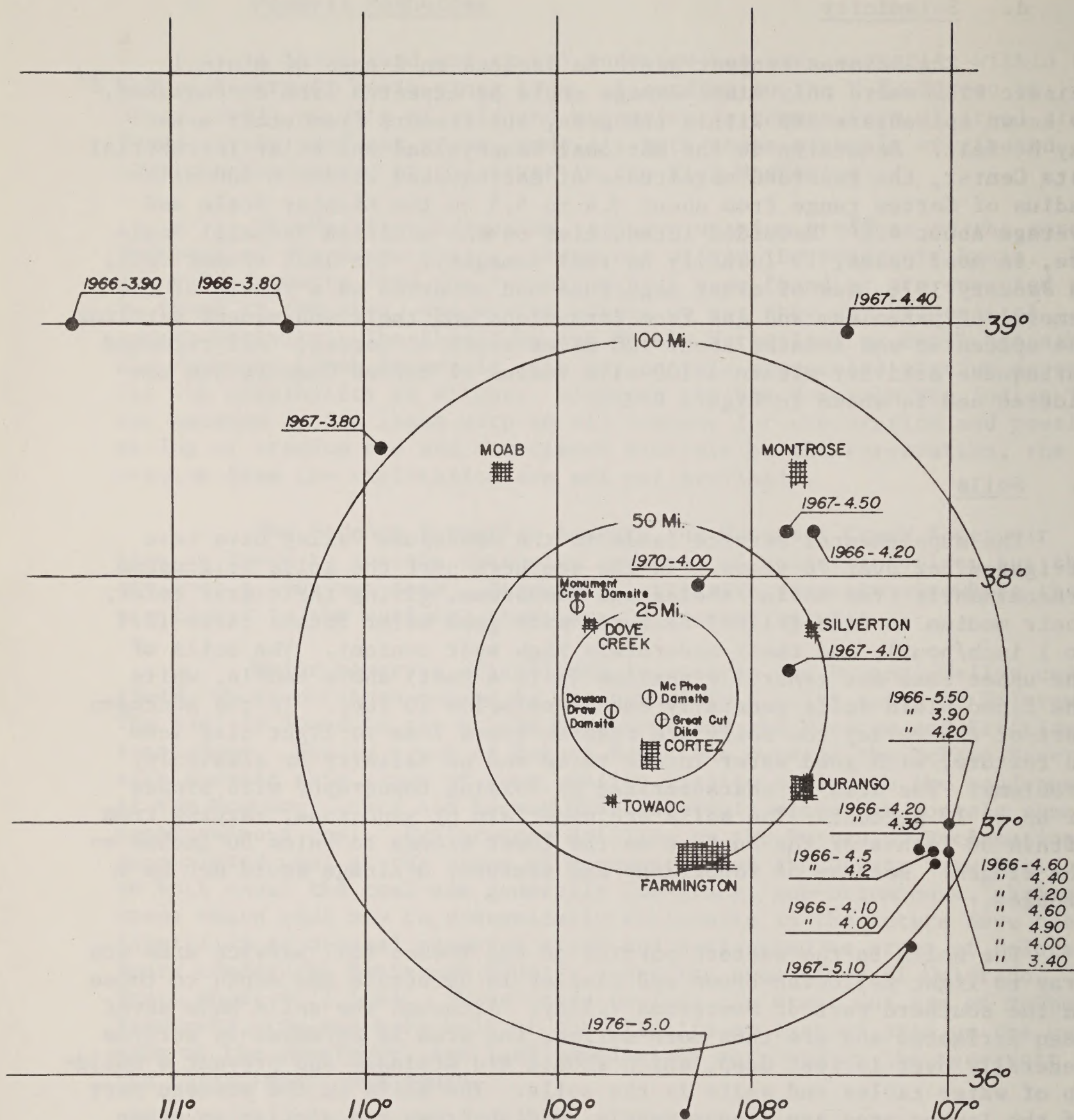
4. Soils

The supplemental service lands in the Montezuma Valley have been irrigated for over 70 years. In the southern part the soils originated predominantly from marine shales and sandstone, giving their gray color, their medium to fine (silty) textures with good water intake rates (0.9 to 1 inch/hour), and their moderately high salt content. The soils of the upper fans are generally shallow (3 to 4 feet) above cobble, while the flood plain soils generally extend to below 20 feet. In the northern part of the valley the soils are reddish-brown loam to light clay loam in texture, with good water intake rates and no salinity or alkalinity problems. The area is characterized by rolling topography with slopes of up to 12 percent. The soils are underlain by sandstone, varying from within 30 inches of the surface on the lower slopes to below 50 inches on the ridges. Because of topography and texture, drainage would not be a problem.

The soils in the eastern portion of the Towaoc full service area are gray to light yellowish-brown and similar in structure and depth to those in the southern part of Montezuma Valley. Although the soils have never been irrigated and are thus more saline, the area is bordered by arroyos generally over 15 feet deep, which should aid drainage and prevent a build-up of water tables and salts in the soils. The soils in the western part of the Towaoc area are predominantly reddish-brown and similar to those found in northern Montezuma Valley. They generally have uniform slopes of between 1 and 3 percent. Sandstone occurs below 8 feet, and in some areas cobbles occur below 24 inches.

^{1/} Seismic Risk Map of the Western United States, U.S. Coast and Geodetic Survey, ESSA, from Algermissen (1969).

^{2/} U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, National Geophysical and Solar-Terrestrial Data Center, Boulder, Colo.



EXPLANATION

● 1966 - 4.0 Earthquake Epicenter With Year and Magnitude (Richter Scale)

SOURCE: National Geophysical and Solar —
Terrestrial Data Center,
Boulder, Colorado

40 0 40
SCALE OF MILES

N.

SEISMIC MAP

DOLORES PROJECT, COLORADO

FIGURE B-2

The soils in the Dove Creek full service area, which is presently dry farmed, are similar to those in northern Montezuma Valley. They are reddish-brown, with medium textures and little or no profile developments. About 7 percent of this land has sandstone within 30-54 inches of the surface, and the rest has sandstone 54 inches or deeper. The irrigable lands in the Dove Creek area are very low in soluble salts and exchangeable sodium.

5. Water Resources

a. General

The project area involves two adjacent rivers both tributary to the Colorado River. The Dolores River flows along the northeastern edge of the area and is the source of most of the water presently being used in the area. The San Juan River flows through northeastern New Mexico to the south of the project area, and its tributaries drain the area. The river is now regulated by Navajo Reservoir, located in New Mexico and Colorado to the southeast of the project area. The two major river systems are shown on Figure B-3, and their flows are summarized in Table B-2.

b. Dolores River Basin

The Dolores River originates to the northeast of the area in the La Plata and San Miguel Mountains. Flowing at first to the southwest, it turns abruptly to the northwest just below the town of Dolores and continues in that general direction to its confluence with the Colorado River near Cisco, Utah. The tributaries in the vicinity of the project area are Beaver Creek and its tributary Plateau Creek, Lost Canyon Creek, and the West Dolores River. Beaver Creek and House Creek enter the river from the northeast about 1 and 4 miles above the proposed site of McPhee Dam, Lost Canyon Creek enters from the southeast at the town of Dolores, and the West Dolores River enters from the northwest about 7 miles upstream from the town of Dolores. The river annually discharges into the Colorado River an average of 507,000 acre-feet, or about 5 percent of the water which enters the lower Colorado River Basin at Lees Ferry, Ariz.

The average annual riverflows at the site of McPhee Dam are estimated at 244,600 acre-feet from 1928 through 1973. The river is very erratic, as Table B-3 illustrates, approaching flood proportions from melting snow in the spring and dropping sharply after midsummer. Approximately 36 percent of the flows occur during the month of May, and about 84 percent occurs during April, May, and June as a result of melting snow in the mountains. Daily fluctuations are even more severe; during about 14 out of every 15 years, the river dries up at the dam site in the late summer or fall as a result of diversions upstream by the Montezuma Valley Irrigation Company.

STREAM SYSTEMS

DOLORES PROJECT, COLORADO

FIGURE B-3

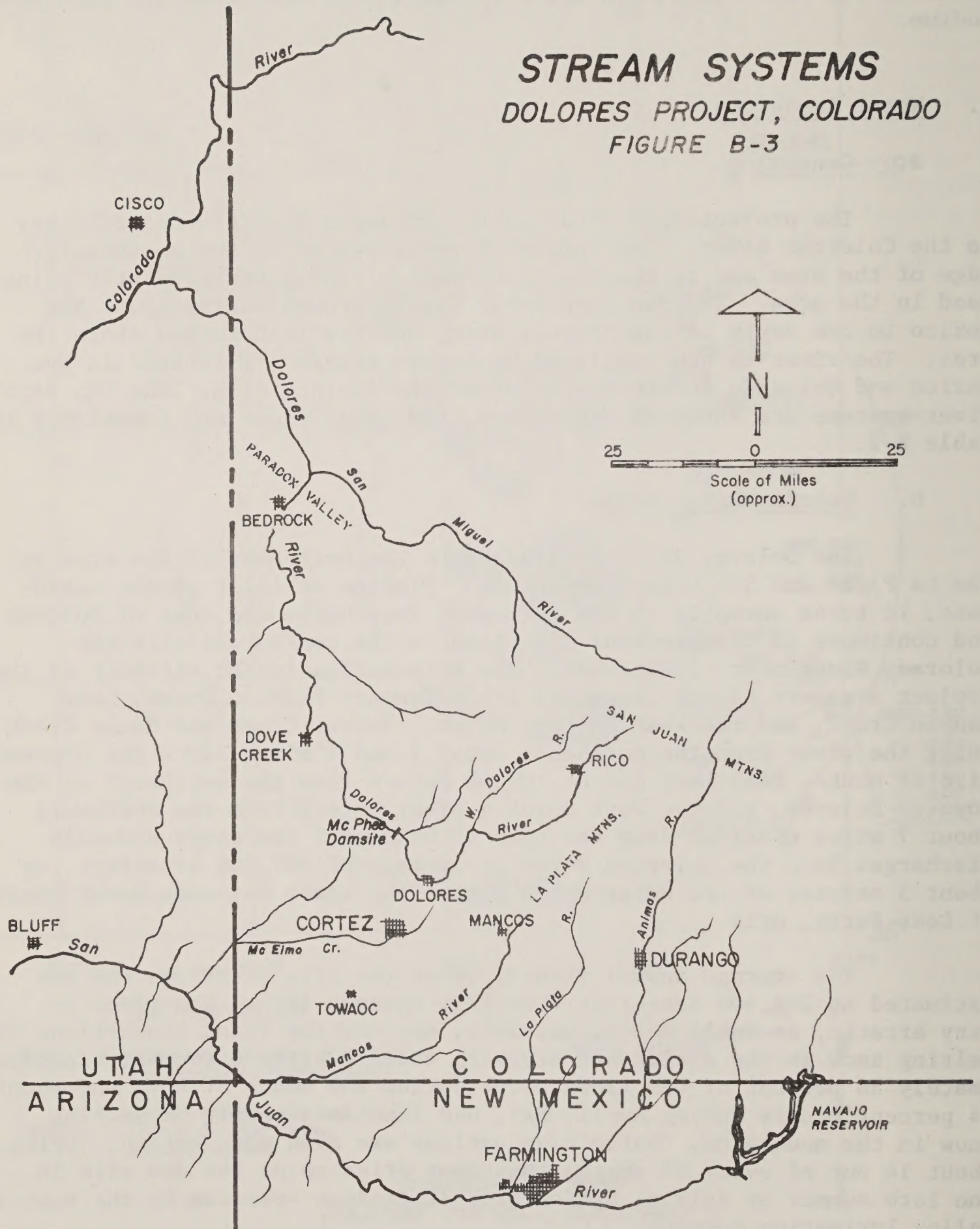


Table B-2
Summary of streamflows at selected points^{1/}
(Rounded figures)

Station	Drainage area (square miles)	Annual runoff (acre-feet)		Range of daily discharge (second-feet)	
		Maximum	Average	Maximum	Minimum
Dolores River Basin					
Dolores River					
At Dolores (1928-73)	504	614,300	298,600	10,000	8
At McPhee Dam site (1928-73*)	809	681,800	244,500	8,200	
At Bedrock (1917-22, 1971-74)	2,024	**	353,000	**	9,300
At Cisco, Utah (1950-74)	4,580	1,086,000	507,000	164,100	3
San Juan River Basin					
Mancos River near Towaoc (1940-43, 1951-)	550	121,000	36,370	9,630	5,300
McElmo Creek near Cortez (1951-)	342	60,450	33,250	14,830	3,040
San Juan near Bluff, Utah (1914-)	23,000	4,899,000	1,873,000	554,000	70,000

^{1/} Water Resources Data for Colorado (Denver: USGS)

* Correlated flows using gauged flows at McPhee Site (1939-52), gauged flows at Dolores, (1928-73), and historic MVIC diversions.

** Insufficient years of record.

Table B-3
Dolores River
Average monthly flows at
McPhee Dam site (1928-73)

Month	Flow (acre-feet)
January	3,200
February	3,100
March	10,300
April	61,900
May	87,800
June	55,000
July	6,500
August	3,200
September	2,500
October	4,500
November	3,200
December	3,400
Total	244,600

The major user and distributor of Dolores River water is the Montezuma Valley Irrigation Company, which possesses an absolute diversion right for 707.7 second-feet to irrigate 46,000 acres of land, a conditional right for 592.3 second-feet to irrigate an additional 38,500 acres, and a right for the year-round use of 100 second-feet for stock, domestic, and industrial purposes. The company diverts an average of 116,000 acre-feet annually (1957-73) at a concrete diversion dam about a mile downstream from the town of Dolores, conveys the water into Montezuma Valley in the San Juan River Basin through a tunnel and a main canal, and distributes the flows to the users through an extensive system of canals and laterals. The Montezuma Valley Irrigation Company experiences shortages of about 13 percent of its annual irrigation requirements, usually in the late summer.

The Montezuma Valley Irrigation Company provides storage and regulation at three reservoirs in and near the project area. Groundhog Reservoir is located on Groundhog Creek, a tributary of the West Dolores River, and has a capacity of 21,700 acre-feet. Water from Groundhog Creek and Little Fish Creek is stored in the reservoir. Narraguinnep Reservoir, located about 10 miles north of Cortez, has a capacity of 19,000 acre-feet. Totten Reservoir, to the east of Cortez, has a capacity of 3,000 acre-feet. Both of the reservoirs store flows diverted from the Dolores River.

Municipal and domestic water for the city of Cortez, Towaoc, and Montezuma Water District No. 1 is delivered through the existing Dolores Tunnel under a contract with Montezuma Valley Irrigation Company. Cortez obtains its water through the acquisition of four priority irrigation rights from the Dolores River Valley and the ownership of 120 shares of stock in the irrigation company (80 shares will provide 1 second-foot of water during the irrigation season). One of the rural water districts owns 100 shares of stock; the other purchases 10 second-feet of water on a year-round basis.

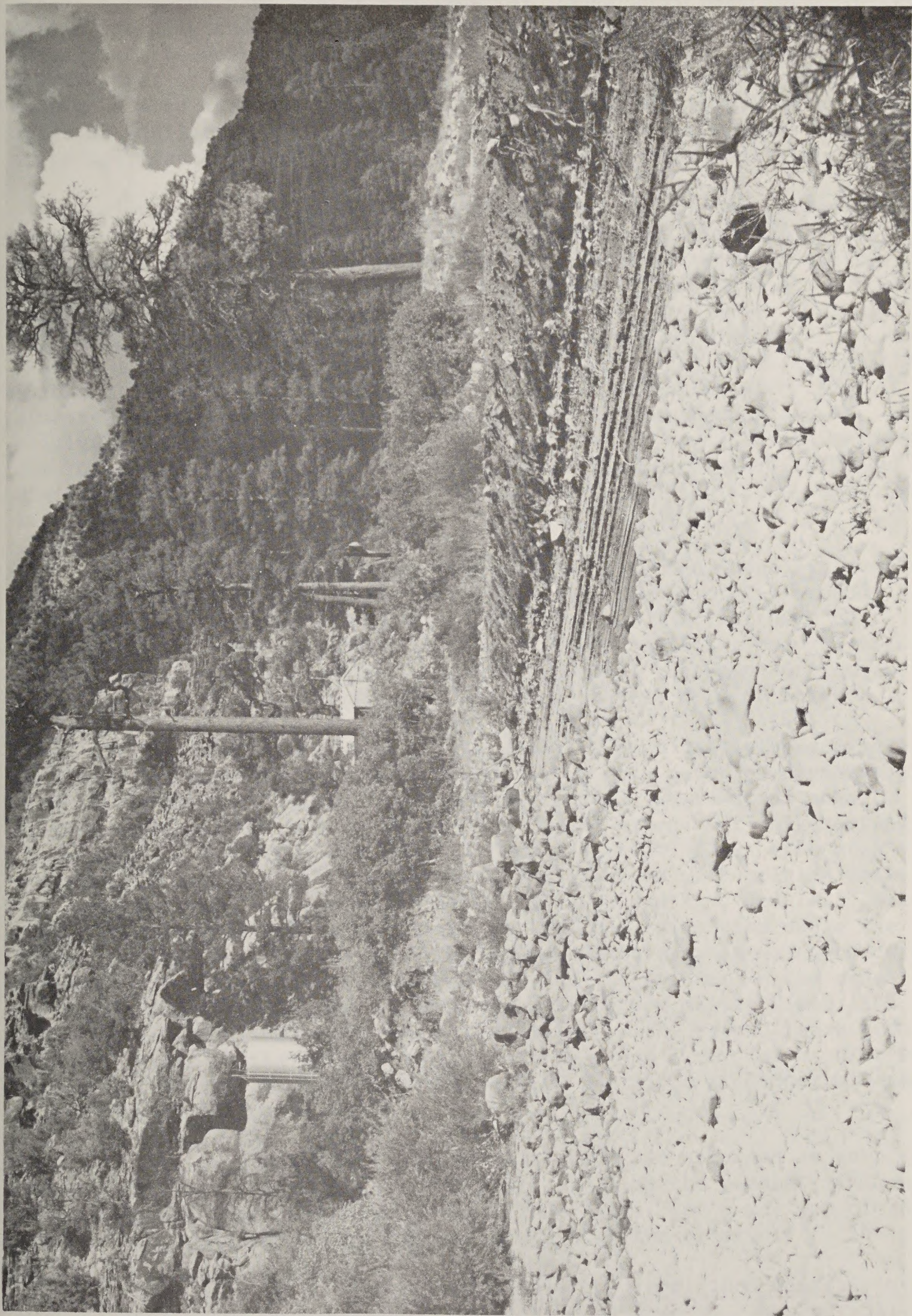


Figure B-4--Dry bed of Dolores River below McPhee Dam site in late summer.

In the past, water supplies for Towaoc have been obtained from wells, springs, and infiltration galleries located near the community, but all of the sources were unreliable and insufficient. The Ute Indians now use part of their 200 shares of stock in the irrigation company to acquire a more adequate supply during the irrigation season when the water is available. The water is conveyed through the company system to a storage reservoir and treatment facility northeast of the town.

The Southern Ute Indians in southwestern Colorado and northern New Mexico are seeking additional water supplies through litigation. A recent suit by the United States on behalf of the Indians is pending. The suit seeks to determine Indian water rights under the Winters Doctrine as it may apply to various tributaries of the San Juan River drainage. The basic concept of this doctrine is that the United States, in establishing Indian reservations, reserved sufficient water supplies for the Tribes. The suit asserts that the Indians did not relinquish their Winters Doctrine water rights on sources within the reservation as originally established and claims such sources are necessary to maintain the Indians on the reduced reservation as it is now geographically defined. Similar adjudication in behalf of the Ute Mountain Ute Indians might be initiated on the Dolores River.

The town of Dove Creek obtains municipal and industrial water from the Dolores River Valley. Obtained under rights of 1.1 second-feet, the water is pumped through a head of about 950 feet over the Dolores-San Juan Divide from two wells drilled into the river gravels. During the low flows of summer, the town is unable to pump sufficient water and must purchase additional supplies, ration use, or both.

The Dolores River generally flows through undeveloped land below the project area, but some flood damage does occur on developed land such as agricultural land, irrigation facilities, residential areas, highways and utilities. The floods are of two types: (1) high spring flows caused by melting snow and (2) summer and fall flows from high intensity rainstorms that occasionally are combined with melting snow. The spring floods, occurring primarily in April and May, generally are longer in duration and larger in volume, but the rainstorms cause the higher peak flows. The Corps of Engineers estimates that damage occurs whenever the riverflows are 6,000 second-feet or greater on the reach from the site of McPhee Dam to the mouth of the San Miguel River (105 river miles) and 7,000 second-feet or greater on the second reach from the San Miguel to the confluence with the Colorado River (about 61 river miles).^{1/} During the 1928-73 study period, the flows at McPhee exceeded 6,000 second-feet on 14 days.

The Colorado Water Conservation Board has obtained an absolute water right with a priority date of May 1, 1975 on the planned minimum flows released from McPhee Reservoir. This right, for a maximum of 78 second-feet, pertains to the Dolores River from the reservoir to the

^{1/} U.S. Army Corps of Engineers, Benefits from Flood Control; McPhee Dam and Reservoir, Dolores River, Colorado (Los Angeles, October 1961).

confluence with the San Miguel River and, in effect, limits the use of the water to the preservation of the stream environment. The diversion and use of the minimum flow for other purposes is prohibited.

c. San Juan River Basin

The San Juan River originates in the San Juan Mountains of Colorado, approximately 100 miles east of Cortez. Flowing in a westerly direction through New Mexico and the southwestern tip of Colorado to the south of the project area, it joins the Colorado River in southern Utah about 100 miles west of Cortez and about 200 miles downstream from the mouth of the Dolores River. The project area is drained by this stream's tributaries, most of which flow only intermittently from spring snowmelt and summer storms. Constant flows are found only in Yellow Jacket Creek and its tributary Dawson Draw, Navajo Wash, and McElmo Creek, all heavily dependent upon irrigation return flows.

Dawson Draw, originating to the north of Narraguinnep Reservoir, drains the northern tip of irrigated land in Montezuma Valley. Although the flows vary from year to year, the average volume is estimated at 4,500 acre-feet annually, as shown in Table B-4. The flows range from less than 1 second-foot to over 20 second-feet.

Table B-4
Dawson Draw
Average monthly flows

Month	Flow (acre-feet)
January	160
February	140
March	390
April	330
May	570
June	850
July	620
August	550
September	180
October	230
November	320
December	160
Total	4,500

Navajo Wash is a tributary of the Mancos River, which originates in the La Plata Mountains to the east of the project area and flows to the southwest, joining the San Juan River near the northwestern corner of New Mexico. Although the upper portion of the river has permanent flows, irrigation diversions frequently deplete the lower portion, which has flows only during runoff from melting snow or summer thunderstorms or from Navajo Wash. The wash originates to the northeast of Towaoc and flows south for about 15 miles to its confluence with the Mancos. Return flows and canal waste from irrigation in Montezuma Valley provide flows during the summer and fall. The flows are highly variable, often exhibiting large fluctuations during a single day.

McElmo Creek originates in Montezuma Valley and flows toward the west, joining the San Juan River in southeastern Utah. Return flows from irrigation in the valley and from urban use in Cortez constitute much of the water in the channel.

d. Ground Water

Ground water resources are very limited. Existing wells yield less than 50 gallons per minute in the Montezuma Valley area and less than 10 gallons per minute in the Dove Creek and Towaoc areas.^{1/} Depths to ground water vary considerably, from less than 50 feet along stream valleys to more than 500 feet on plateaus and stream divides. The volume of recoverable water in the upper 100 feet of saturated rocks is estimated to be less than 2 acre-feet per acre in the Montezuma Valley area and less than 0.5 acre-foot per acre in the Dove Creek and Towaoc areas.

6. Water Quality

Information on water quality is available for the Dolores River, McElmo Creek, Navajo Wash, the Mancos River, and the San Juan River. Man's activities have strongly influenced the quality of water, causing it to differ considerably at each of the sites. Attachment 1 contains tables on water quality.

a. Dolores River at Dolores

Immediately below the town of Dolores, the quality of the Dolores River is well within the U.S. Public Health Service and Colorado State drinking water standards. Samples collected by the Bureau of Reclamation from 1953 through 1960 contained total dissolved solids (TDS) in a flow-weighted average concentration of 127 milligrams per liter (mg/l). Depending upon the time of year, the concentrations varied from 79 to 352 mg/l.

The Colorado State Department of Health collected 36 water samples at Dolores from 1969 through 1975.^{2/} Although its analyses indicated the presence of the heavy metals iron, zinc, and mercury and the toxic substances arsenic and selenium, none of these elements exceeded the recommended limits for domestic water.

Mining activity in the Rico area, about 40 miles upstream from Dolores, has historically introduced fluctuating amounts of heavy metals and toxic substances into the river. Although the quality of the water

^{1/} Colorado Water Conservation Board and United States Department of Agriculture, Water and Related Land Resources: San Juan River Basin; Arizona, Colorado, New Mexico, and Utah (Denver, June 1974).

^{2/} Provided by the Air and Water Surveillance and Analysis Division, Environmental Protection Agency, Denver, Colo.

is poor near Rico, it improves downstream because of dilution by tributary streams and springs and the presence of alkaline soils. The concentrations of metals, toxic substances, and alkalinity undergo dramatic changes, and by the time the river reaches Dolores all of these factors are within the recommended standards for culinary use and can be readily handled by modern treatment processes. The towns of Dolores and Cortez have been treating and using the water for many years, with no apparent problems of treatment or health. The metals and toxic substances are not soluble in water with a pH of at least 7.5 and a hardness of about 250 mg/l,^{1/} both of which have been recorded at Dolores (average pH of 8.1 and hardness of up to 265 mg/l.) These conditions, under which nearly all of the metals would precipitate, and the interaction of all the substances present should result in minimal problems of toxicity. The alkalinity of the water also decreases the threat of heavy metals to aquatic organisms, since the metals precipitate in forms that are unavailable for biological intake. Although certain fish and invertebrates do exhibit low levels of tolerance to certain dissolved metals and the levels may be periodically exceeded, two factors minimize this problem. Most of the metals are insoluble, and sustained exposure (a significant factor) does not appear to occur.

The turbidity, temperature, dissolved oxygen, and nutrient levels are within the limits necessary for a diverse and healthy biological system. Although not posing any problems, the levels of nutrients and coliform bacteria do reflect sewage discharges and urban runoff. High levels of organic pollutants are occasionally produced by washouts at the town of Dolores sewage treatment plant, which does not meet effluent standards, but such occurrences are not frequent or long in duration.

b. Dolores River Below Dolores

Diversions of the Montezuma Valley Irrigation Company, which sometimes deplete the entire flow during the irrigation season, are a major cause of deterioration in the quality of the river downstream from Dolores. Samples collected at Bedrock (about 105 miles downstream from the site of McPhee Dam) from 1971 through 1975 had an average TDS of 702 mg/l and a flow-weighted average of about 265 mg/l, with individual samples varying from 120 to 2,770 mg/l. The temperature and turbidity are also higher than near the town of Dolores because of lower flows, higher air temperatures, and the high susceptibility of the soils to erosion. The samples also contained some radioactive material, indicating uranium mining upstream.

Dissolved oxygen and pH concentrations are compatible with biological productivity, but high temperatures (32-85° F.) and turbidity could inhibit productivity and diversity. High temperatures occur most of the year because of low flows and high turbidity. The turbidity, which is contributed largely by tributaries, is caused by natural erosion

^{1/} Guy W. Harris, Jr., The Impacts of Various Metals on the Water Quality in Ridgway Reservoir (Bureau of Reclamation, July 1976), p.8.

and human disturbances of the soil. Nutrient levels are moderate. Occasional high levels of phosphorus and fecal coliform indicate the presence of upstream sewage discharges but do not cause problems of eutrophication. Heavy metals and toxic substances are present in varying concentrations, primarily because of erosion. They would not prohibit the use of the water for livestock, although they would require extensive treatment for human consumption. Because of the temperature and chemical factors and their interaction, it is probable that heavy metals and toxic substances would remain in chemical forms unavailable for biological uptake.

c. McElmo Creek

Because of several factors, the quality of McElmo Creek is poor compared to that of the Dolores River.^{1/} Studies by the Bureau of Reclamation indicate that return flows from irrigation and the presence of saline Mancos Shale in the drainage area contribute to high TDS concentrations, averaging 2,650 mg/l near Cortez and 2,880 mg/l near the Colorado-Utah State line. Near Cortez, sulfate varies from 870 to 3,000 mg/l, and calcium varies from 35 to 640 mg/l. The overall quality of the stream varies considerably because of fluctuations in the volume of the return flows.

The water is basically alkaline (average pH 8.2) and has high turbidity levels and temperatures (32-81° F.). Man's influences are evident in the levels of nutrients found in this water. The presence of nitrates and phosphates reflects water carried wastes and fertilizers originating from a variety of land uses. Concentrations of cyanide and selenium are greater than the recommended culinary water limits. Arsenic is also present but at minute concentrations. The alkalinity and other qualities of this water promote a condition whereby nutrients, heavy metals, and toxic substances are present in insoluble forms. A sample collected in September 1976 indicated that pesticide levels were well within the limits recommended by the Environmental Protection Agency.

Overall, the water is very saline and quite hard. The high levels of dissolved salts, turbidity, and temperatures create a harsh environment for many fresh water fish and invertebrates.

d. Navajo Wash

Flow in Navajo Wash is derived primarily from irrigation return flows during much of the summer and fall, and both the flow and turbidity fluctuate often, even within the same day.^{2/} The quality of the water is generally poor. Samples collected by the Bureau of Indian Affairs since 1968 have had TDS concentrations ranging from 6,330 mg/l during low flows to 1,980 mg/l during high flows. Pesticide levels are within the recommended limits, according to a sample collected in September 1976.

^{1/} The Air and Water Surveillance and Analysis Division of the EPA in Denver provided all information, with the exception of the TDS.

^{2/} Buddy Lee Jensen, Fisher Management Biologist, Dolores Project Investigations: Ute Mountain Ute Indian Reservation, Colorado and New Mexico (U.S. Fish and Wildlife Service: Gallup, N. Mex., January 30, 1975).

e. Mancos River

The Geological Survey sampled the Mancos River near Towaoc from December 1972 through August 1973.^{1/} Fluctuating according to the stream-flow, the concentration of TDS varied from 328 mg/l during the high flows of June to 1,780 mg/l during the low flows of December. The only constituent exceeding the recommended limits for drinking water was sulfate, which reached 930 mg/l. Pesticide levels are within acceptable limits.

f. San Juan River

During the 1972-73 program, the Geological Survey also collected samples from the San Juan River at the Colorado-New Mexico State line.^{1/} The TDS concentrations varied from 242 to 554 mg/l, and the only constituent that exceeded the limits for drinking water was sulfate, with a high recording of 280 mg/l. Pesticides and bacteria were acceptable, although one sample had a fecal coliform count at the upper limit for domestic water.

g. Ground Water

The TDS concentrations of ground water in the project area vary from about 250 to 3,000 mg/l. In the lower elevations of the McElmo Creek drainage, the salinity is between 250 and 1,000 mg/l; in the rest of the area it varies from 1,000 to 3,000 mg/l.

7. Vegetation and Land Use^{2/}

a. General

In Montezuma and Dolores Counties vegetation reflects the changes in elevation and precipitation, which generally increase from southwest to northeast. The corresponding vegetative communities are salt desert shrubs, grass lands, irrigated and dry crop lands, pinon-juniper wood lands, intermountain wood lands, mountain shrubs, and coniferous forest. Riparian

^{1/} George H. Leavesley, Quantity and Quality of Principal Rivers Entering the Southern Ute and Ute Mountain Ute Indian Reservations, Colorado and New Mexico (U.S. Geological Survey: Lakewood, Colo., 1975).

^{2/} Sources: Colorado Water Conservation Board and United States Department of Agriculture, Water and Related Land Resources: Dolores River Basin, Colorado and Utah (Denver: September 1972), pp. III-17 - III-35.

Colorado Water Conservation Board and United States Department of Agriculture, Water and Related Land Resources: San Juan River Basin: Arizona, Colorado, New Mexico, and Utah (Denver: June 1974), pp. III-31 - III-48.

H.E. Owen, Final Vegetative Inventory Report for the Dolores Project (Durango, Colo.: August 1, 1974), pp. 31.

Colorado State University Rapid Access Plant Information Center (RAPIC) July 19, 1976.

vegetation, found along all of the streams in the area, varies locally according to characteristics of streamflow, soil, and climate. Figure B-5 illustrates the distribution of the communities in the area.

The major agricultural uses of the land are farming, grazing, and forestry. Grazing on native range partially supports livestock, but additional feeds are required from irrigated land. Wildlife habitat and recreation are also major uses of land and are generally compatible with other uses. Mining, transportation, utilities, and urban areas occupy a small percentage of the land area.

(1) Salt Desert Shrubs

Located at an elevation of 6,000 feet or less, the salt desert shrub community occurs primarily along the Mancos River in southern Montezuma County. Greasewood, rabbitbrush, and tamarisk are commonly found in the hot, dry climate in areas with high, usually alkaline, water tables.

(2) Grass Lands

A sparse, semidesert grass land community, varying in elevation from 4,800 to 6,000 feet, characterizes most of southwestern Montezuma County, including all of the project land in the Towaoc area, and also occupies an area east of Cortez. Yucca and prickly pear cactus are common wherever the land has been disturbed. Forbs indicate disturbances at all elevations but usually decrease as the grasses become reestablished. Grazing of livestock is the primary use made of this vegetative community.

(3) Irrigated and Dry Crop Lands

Irrigated crops (at 5,500 to 7,500 feet) are grown primarily in the Montezuma Valley area, where the project supplemental service land is located, and smaller irrigated areas are located along the Dolores River and to the east of the project. The major vegetation is alfalfa, meadow hay, and pasture.

Dry crop land, generally between elevations of 6,500 and 7,500 feet, is found in northwestern Montezuma County and western Dolores County. Encompassing all of the project land in the Dove Creek area, this vegetative community consists of pinto beans, winter wheat, and scattered islands of pinon-juniper wood land.

(4) Pinon-Juniper Wood Lands

Extensive stands of pinon pine intermingled with Utah and Rocky Mountain juniper are found along canyons and in mountain areas between 5,000 and 7,500 feet. Varying from open to dense, the stands often grow among rocky surfaces and outcrops that limit the understory to forbs and grasses. This community is characteristic of the canyons and other uncultivated parts of the Dove Creek area and forms the western border of the irrigated Montezuma Valley area.

(5) Intermountain Wood Lands

Found between 6,000 and 8,000 feet in elevation, this wood land consists of pinon pine and juniper with a brushy understory of bitterbrush, big sagebrush, mountain mahogany, cliffrose, and Gambel's oak. Forbs and grasses are also found in the understory. This community marks the southern boundary of the Dove Creek area and the eastern boundary of the Montezuma Valley area.

(6) Mountain Shrubs

The mountain shrub community, composed mainly of Gambel's oak, is found at elevations of 6,000 to 8,000 feet on the northeast side of the project area and occupies a transitional zone between grass lands and coniferous forest. The shrubs also replace stands of ponderosa pine removed by logging or fire. Grasses form the understory of the community.

(7) Coniferous Forests

Forests of ponderosa pine intermixed with scattered stands of Douglas fir are found to the northeast of the project service area between 6,000 and 9,500 feet. The coniferous forest often consists of open stands that permit an extensive herbaceous understory and is often interspersed with grass lands. On northern slopes, however, the timber is often very dense, and the lack of sunlight retards the development of an extensive understory.

(8) Riparian

The Dolores River and other streams in the area have narrow bands of riparian vegetation. Among the dominant species are cottonwood and box elder trees interspersed with dense growths of willows, alder, and hawthorne. Forbs and shrubs make up the understory.

b. Project Features

About 15,274 acres of land would be acquired for McPhee Reservoir and associated developments. As Table B-5 shows, pinon-juniper wood land is the most extensive community in the area, followed by irrigated crop land and grass land. Part of the site, consisting of the river channel, rocky waste land, and a gravel pit, supports no vegetation. At the site of Monument Creek Reservoir, the vegetation consists of dry crop land, seeped pasture, and native grass land. Dawson Draw Reservoir would be located in an area now characterized by grass land and marsh, with a small amount of irrigated pasture and pinon-juniper wood land.

The proposed rights-of-way for the Dove Creek and South Canals would contain about 580 acres of land, consisting of crop land, pinon-juniper wood land, and intermountain wood land. The Dolores and Towaoc Canals contain 750 acres of irrigated crop land, grass land, pinon-juniper wood land, and intermountain wood land.

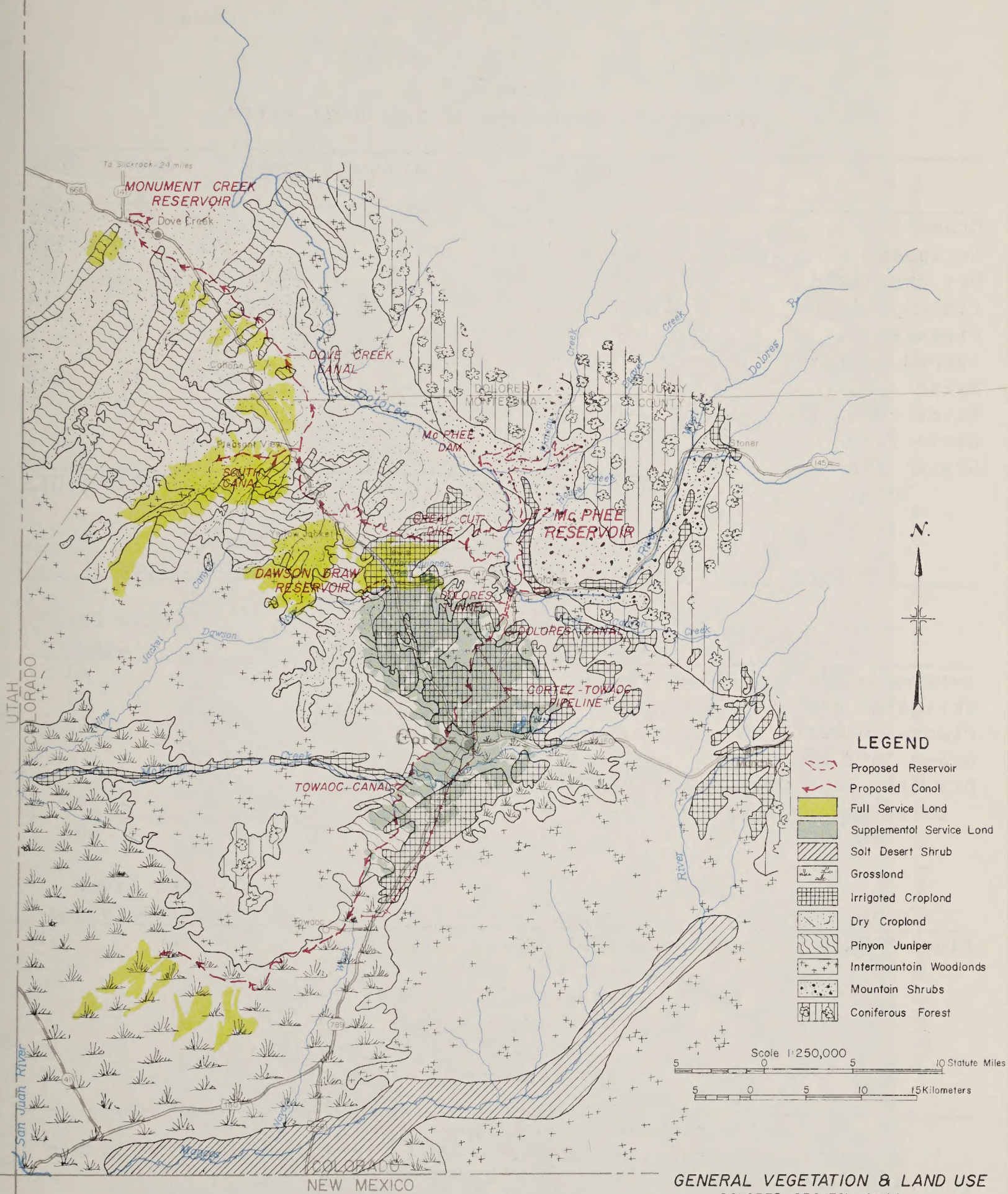


Table B-5
Vegetative communities at reservoir sites
(acres)

	McPhee		Monument Creek		Dawson Draw	
	a	b	a	b	a	b
Grass land	816	1,661	6	42	219	682
Irrigated crop land	989	2,013			2	118
Dry crop land	197	810	46	260		
Pinon-juniper	1,619	9,194				10
Riparian	448	969				
Seeped pasture			32	70		
Marsh					73	262
River channel	240	270				
Waste land	75	189				
Gravel pit	86	168				
Total	4,470	15,274	84	372	294	1,072

Vegetative communities at canal sites, tunnel,
Cortez-Towaoc pipeline and Dolores River recreation sites

	Dolores and Towaoc Canals		South Canal	Dove Creek Canal
Intermountain wood land	44			41
Irrigated crop land	150			71
Pinon-juniper	250			101
Grass land	306			
Dry crop land with scat- tered pinon-juniper			95	270
Total	750		95	483

Dolores Tunnel		Cortez-Towaoc Pipeline		Dolores River recreation sites	
Pinon-juniper	3	Pinon-juniper	6	Riparian	78
		Dry crop land	7		
		Irrigated crop land	10		
		Waste land	48		
		(Existing highway right-of-way)			
			71		

a. Within the high water surface.

b. Within the takeline (right-of-way), including the area within the high water surface.



Figure B-6--Rows of pinto beans on dry farm land in Dove Creek area.

c. Threatened and Endangered Plants

Five plants within the general vicinity of the project are included on a proposed list as endangered.^{1/} Four of these (Acer grandidentatum, Astragalus humillimus, Astragalus schmollae, and Sclerocactus mesa-verdae) are found only in Mesa Verde National Park outside the project area.^{2/} The other plant (Atreplex pleiantha), has been identified and collected only once, on June 12, 1949, by W. A. Weber. The specimen was found about 10 miles south of the project land in the Towaoc area.

8. Fish and Wildlife

a. Fish and Aquatic Invertebrates

(1) Dolores River^{3/}

Above the town of Dolores, the Dolores River is a cool mountain stream supporting a trout fishery, although man has altered the habitat. Spills from mine tailing ponds adversely affected the river in the past, but the present evidence of aquatic organisms is an indication of recovery. Below the town of Rico, which is about 40 miles upstream from Dolores, the river has undergone channelization for flood control and associated gravel mining, which has disrupted fish spawning, resting, and food producing areas.

The Colorado Division of Wildlife annually stocks about 8,000 catchable rainbow trout in the mainstem of the river above Dolores and approximately 16,000 in the West Dolores River. Fisherman use for the entire upper portion of the river is estimated at 21 to 28 fishermen per river mile per year, for an annual use of 1,281 to 1,708 fishermen days. Other species of trout present in the upper Dolores River include eastern brook trout, brown trout, and cutthroat trout which enter the river from its tributaries. Nongame fishes inhabiting the upper Dolores include species such as the mottled sculpin (the most abundant), flannelmouth sucker, bluehead sucker, speckled dace, brassy minnow, and fathead minnow.

Below the diversion facilities of the Montezuma Valley Irrigation Company 1 mile south of Dolores, where the river has reduced flows and warmer temperatures, sport fishes are rare. Although the Colorado Division of Wildlife stocked 6,600 fry and fingerling trout between

^{1/} Endangered and Threatened Wildlife and Plants, Federal Register, Vol. 41, No. 115, Part II (Monday, June 14, 1976) pp. 24062-24067, and Vol. 41, No. 117, Part IV (Wednesday, June 16, 1976), pp. 24524-24572.

^{2/} Stanley L. Welsh and James A. Erdman, Annotated Checklist of the Plants of Mesa Verde, Colo., Biological Series Vol. IV, No. 2 (Provo, Utah: Brigham Young University, April 1964).

^{3/} Colorado Division of Wildlife, Fish and Wildlife Analysis for the Dolores Water Project (September 1973 to June 1974), pp. 107-123.

Dolores and the Utah State line in 1971 and 1973, the success of the program is unknown. In a 1973-74 survey, the only sport fish observed were several brown trout downstream from the diversion dam and a channel catfish at Slick Rock. The speckled dace and flannelmouth sucker are abundant in the lower portion of the river. The black bullhead, brassy minnow, fathead minnow, roundtail chub, red shiner, and carp are also common.

Aquatic invertebrates, an important source of food for fish, are found in all reaches of the river. Mayfly, stonefly, and caddisfly larvae, which are indicative of cool water temperatures and high oxygen levels, have been collected above Dolores, as have crane fly larvae, water mites, midges, and beetles. Mayfly, stonefly, and crane fly larvae are also present between Dolores and Slick Rock.

Tributaries of the river in the project area do not generally have sufficient flows to support fish. Surveys conducted during August 1976 revealed that Dry Canyon and House Creeks were dry and that Beaver Creek contained a negligible flow above its confluence with Plateau Creek. Plateau Creek and Beaver Creek below the confluence had a flow of 0.5 second-foot. Species found in these sections consisted of a small number of speckled dace in Plateau Creek and a large number of young-of-the-year roundtail chubs in Beaver Creek. The low flow, warm temperatures, and excessive silt have prohibited the development of a sport fishery.

(2) San Juan River Basin

The major streams providing flows to support fish in the San Juan Basin portion of the project area are the San Juan River, Navajo Wash, the Mancos River, and McElmo Creek. In late September and early October 1974, the Fish and Wildlife Service conducted field investigations on the Ute Mountain Ute Indian Reservation, including part of the San Juan River, Navajo Wash, and part of the Mancos River.^{1/} All of the streams contain minimal populations of game fish because of low flows, frequent changes in flow, sediment loads, and warm temperatures. The Mancos River above Navajo Wash was dry during the study. No collections were made on McElmo Creek.

A total of 43 fish were collected in the San Juan River where it enters the southwest corner of Colorado, consisting of fathead minnows, red shiners, carp, and a single flannelmouth sucker. The only live stream section located on the Mancos River was below the confluence with Navajo Wash, which contributes approximately 1 second-foot of water. The sample taken on this section revealed populations of fathead minnows, red shiners, and roundtail chubs. Flows in Navajo Wash fluctuate frequently due to intensive agricultural use of water on the upper watershed. During the fisheries inventory, volumes of flow ranged from 1 second-foot at the confluence with the Mancos River to 5 second-feet at the upper end. Daily changes in flow and turbidity are common. A

^{1/} Buddy Lee Jensen, Fishery Management Biologist, Dolores Project Investigation: Ute Mountain Ute Indian Reservation, Colorado and New Mexico (U.S. Fish and Wildlife Service, January 31, 1975.)

total of 427 fish was collected from this stream, consisting of speckled dace, fathead minnows, flannelmouth suckers, bluehead suckers, roundtail chubs, red shiners, and carp.

Caddisflies, dragonflies, mayflies, midges, and nematodes were collected from Navajo Wash and the San Juan River. The sample taken on Navajo Wash at its junction with the Mancos River is probably indicative of stream productivity throughout the area. Square foot bottom samples were collected at three locations on the wash, and productivity was poor due to conditions previously mentioned. An average of 36 organisms comprised a volume of 0.4 cc per square foot of bottom sampled. Sampling of aquatic invertebrates in the San Juan River also revealed limited productivity, with 110 organisms comprising a volume of 0.5 cc per square foot sampled.

An additional study, funded by the Fish and Wildlife Service to determine the status of endangered fish species in the San Juan River, revealed species that were not reported in the October 1974 study. These fishes, which were collected in the San Juan River from Navajo Reservoir to Lake Powell, include the black bullhead, channel catfish, bluehead sucker, speckled dace, smallmouth bass, green sunfish, rainbow trout, brown trout, mosquito fish, and Rio Grande killifish.

b. Wildlife

(1) General

Information on the wildlife resources of the Dolores Project area has been collected from several different sources through cooperative agreements with the Bureau of Reclamation. In 1974, the Colorado Division of Wildlife completed a report entitled "Fish and Wildlife Analysis for the Dolores Project Area." The report presents an inventory of the game and nongame terrestrial and aquatic wildlife resources on non-Indian lands in the project area. The report also predicts the impacts on the various species which would be affected by the project. Wildlife within that portion of the Ute Mountain Ute Indian Reservation affected by the project was inventoried by the Fish and Wildlife Service. One report by the Service covered the aquatic wildlife on the reservation, and a second was concerned only with the terrestrial wildlife. An additional report by Dr. Preston Somers of Fort Lewis College in Durango, Colo., inventoried the amphibians and reptiles in the project area. A complete list of all wildlife species found in the area, including habitat types, population, and seasonal occurrence, is available for inspection at the Bureau of Reclamation Regional Office in Salt Lake City, Utah, and at the Bureau's field office in Durango, Colo.

(2) Big Game Mammals

(a) Mule Deer

Since around 1900, much of the winter range that supported mule deer in the project area has been converted to farm

land and other uses. Historic migration routes have also been changed by man-made barriers such as fences, roads, and highways. The mule deer is still found in the area but only in certain portions of its former range. The deer populations use different seasonal areas classified as summer range, spring-fall range (migration routes), and winter range.

Two distinct populations of deer inhabit summer ranges in the project area--one that summers north of the Dolores River and one that summers in and around Mesa Verde National Park. The population north of the Dolores River inhabits land generally above 8,000 feet in the San Juan National Forest. There is an abundance of range, and the deer are widely scattered throughout the forest. The Mesa Verde population summers at elevations above 7,000 feet, where the vegetation is predominantly intermountain wood land. This range is drier than that on the National Forest, and deer seek water from intermittent springs and streams in the late summer.

During the fall, heavy snow at high elevations forces the deer to lower areas where food is available. This spring-fall range, which is used during migrations, varies in elevation from 6,500 to 8,000 feet and is composed of the coniferous forest, intermountain wood land, and mountain shrub vegetative communities. During the spring, when the deer move up from their winter range, the spring-fall range serves as a fawning ground, particularly in the regions of House Creek, Narraguinne Canyon (located about 10 miles downstream from the proposed McPhee Dam), and Summit Reservoir (located about 8 miles southeast of Dolores). A small resident population of deer is found on the lower elevations of the project area.

Winter range for deer, shown in Figure B-7, is normally found at elevations below 7,000 feet. Nearly half of the deer in the project area winter in the Dolores River Canyon from Stoner to Dove Creek. During migration, most deer move off the National Forest directly into the canyon. As the winter progresses, some continue moving south and west onto the smaller wintering areas, and additional deer may be forced from the Dolores Canyon into these areas during winters of heavy snowfall. Because of this concentration, these areas are designated as critical winter range. Another heavily used winter range is found along U.S. Highway 160 east of Cortez, where deer from the upper Dolores River and Mesa Verde are found from December until April. Winter ranges are also located along Cross and Yellow Jacket Canyons at lower elevations, where there is a mixture of crop land and native vegetation.

The Colorado Division of Wildlife estimates that about 10,000 deer inhabit game management units 71, 72, and 73, encompassing Montezuma and Dolores Counties and generally along the Dolores River Valley to Slick Rock, Colo. (shown in Figure B-8). The average annual harvest was about 2,600 deer from 1969 through 1973. The winter population of deer occupying the McPhee Reservoir site has been estimated

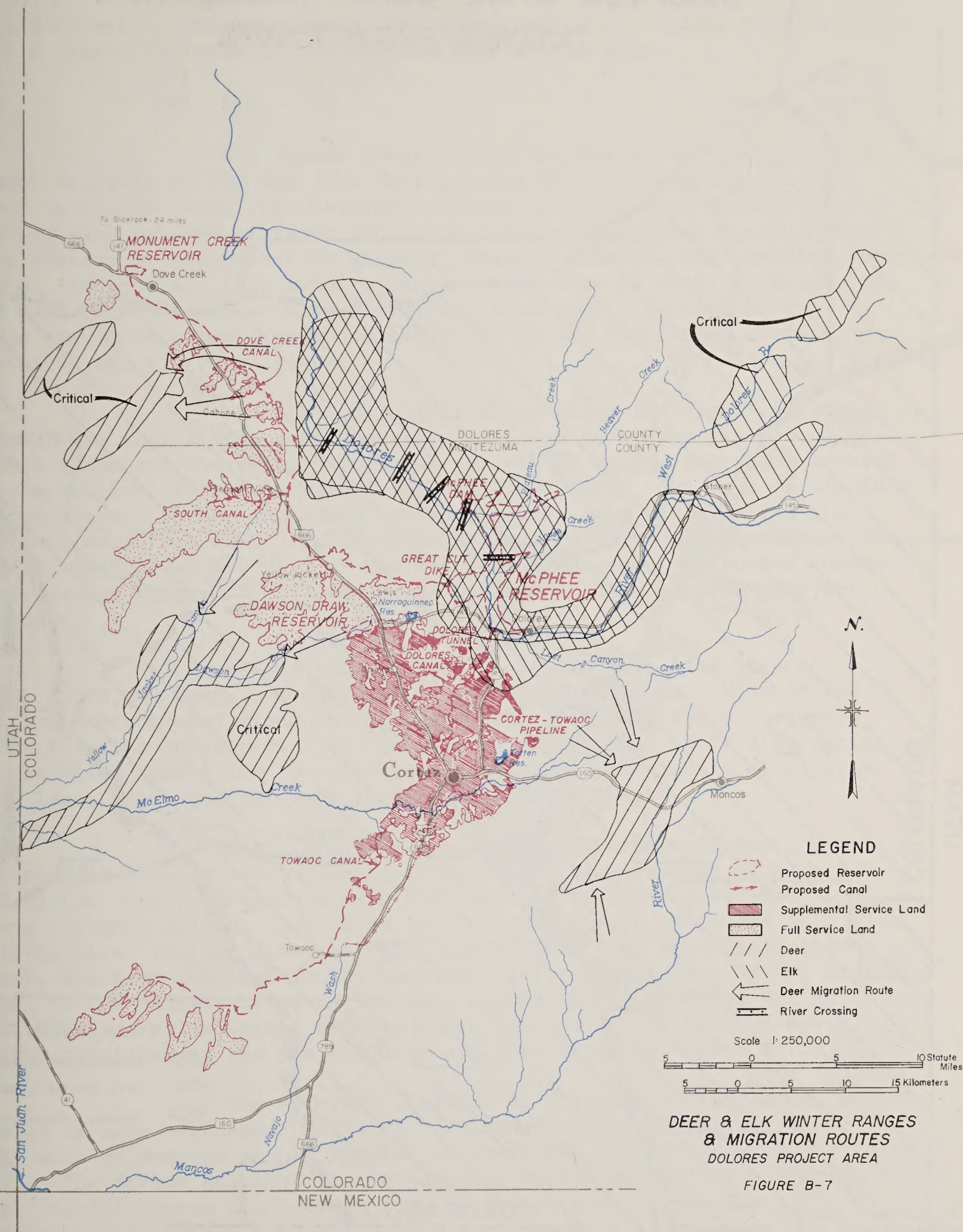
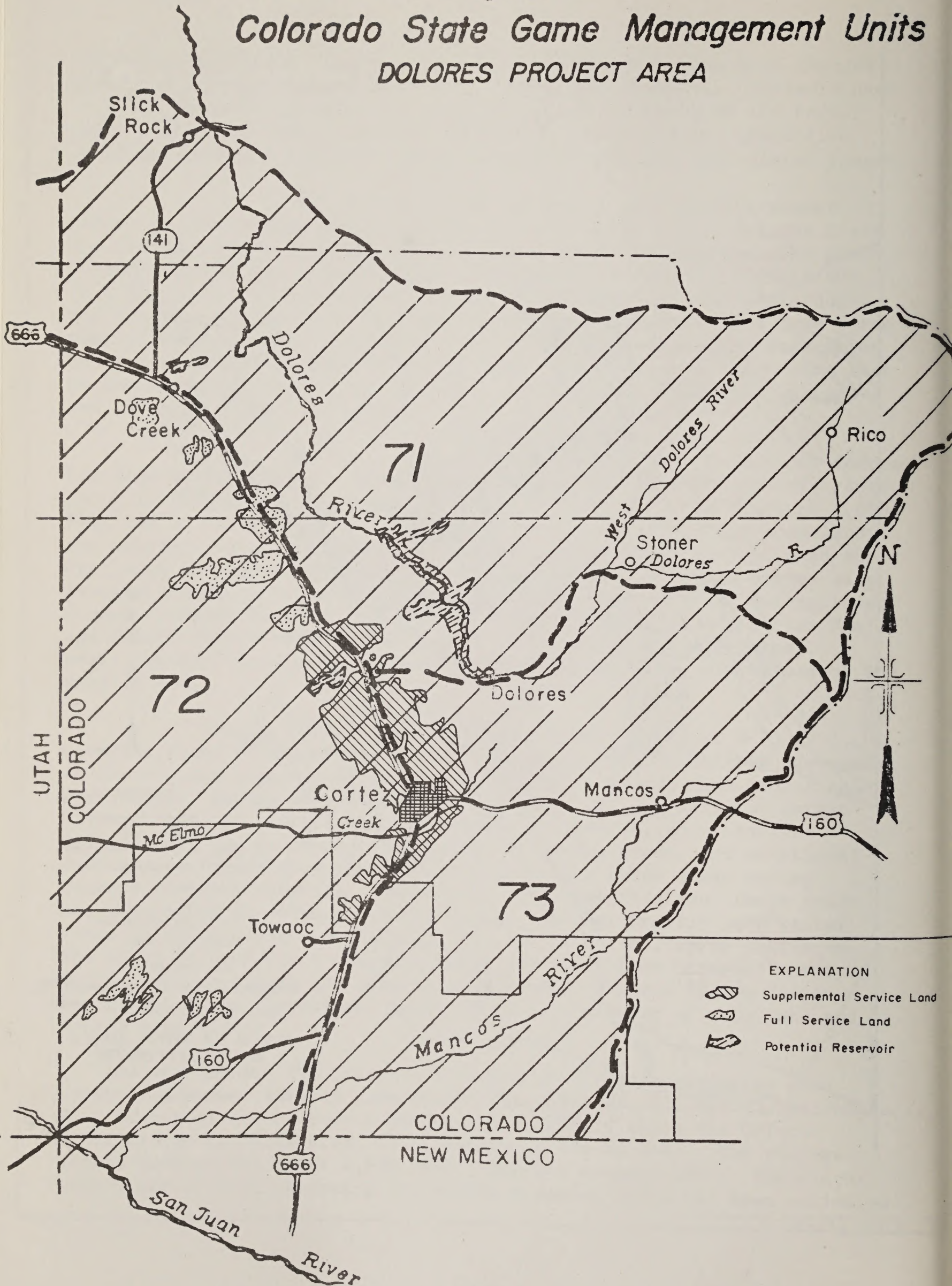


Figure B- 8
Colorado State Game Management Units
DOLORES PROJECT AREA



at 450 animals. The management goal is to maintain a stable population, with a slight increase in the western part of the area.

(b) Elk

Elk summer range in the Dolores River drainage lies almost entirely on the San Juan National Forest, at elevations of from 7,800 to 14,000 feet. The habitat consists of coniferous forest interspersed with patches of aspen and large open parks. These parks consist of a variety of high altitude grasses, sedges, willows, and herbaceous forbs. In general, this range coincides with that of deer, although the elk band together rather than dispersing like deer. Because of the large amount of summer range available, it is not considered a limiting factor to the elk population.

The elk spring-fall range which is relatively small compared to that of the deer, normally includes the lower portion of its summer range and the upper portion of its winter range, generally located on the National Forest between 7,500 and 8,000 feet. The area is within the coniferous forest community, which provides food and cover as the elk move down from their summer range because of snow accumulations. In the spring, calves are born as the elk follow the snowline upward toward their summer range. No calving areas were found near proposed project features.

Winter range, shown in Figure B-7, lies between 6,500 and 9,600 feet, concentrated in six distinct areas. Most of the elk are concentrated along the Dolores River from just above Stoner to about 15 miles downstream from the site of McPhee Dam. This area varies in elevation from 6,500 to 7,500 feet and supports a mixture of riparian wood land, pinon-juniper wood land, and mountain shrubs.

Elk migrations, which vary from year to year, are not as extensive as deer movements because of the proximity of summer and winter range. Movements vary from year to year but generally occur along the West Dolores River from the National Forest southward into the Dolores River Valley, from the high country near Rico down the Dolores River, and from the Lost Canyon area into winter range east of the project area. A few animals cross the highway between Dove Creek and Cortez, wintering in Yellow Jacket and Sandstone Canyons. Five Dolores River winter crossings in the project area are identified in Figure B-7.

The Colorado Division of Wildlife estimates the population in game management units 71, 72, and 73 at approximately 1,800 elk, with an average annual harvest of about 650 animals from 1969 through 1973. The McPhee Reservoir basin supports approximately 300 wintering elk. Aerial counts and harvest figures indicate an increasing elk population throughout the area.

(c) Mountain Lion

The mountain lion ranges throughout the project area, although it concentrates along the Dolores River, Cahone Canyon,

McElmo Creek, and the Mancos River. Its hunting radius is quite extensive, since it often preys on deer and follows the herds to and from their seasonal ranges. Other prey includes rodents, rabbits, skunks, and occasional livestock.

Because of its extensive range and dependence on a variety of prey species, the lion habitat encompasses all life zones found within the project area. The lion is known, however, to prefer rough, broken terrain found along canyons and ridge tops. Two known hunting routes are located immediately south of the town of Dolores, extending northeasterly across the Dolores River, and a third extends southwest of the town of Dove Creek, between Squaw Canyon and Monument Creek.

No lions are known to have been harvested from game management units 71, 72, and 73 since 1965. The 1974 population for these units is estimated at between 5 and 29 animals. Current techniques for estimating the population are not sufficiently refined to produce reliable estimates. Therefore, to remain statistically correct the figures contain very broad confidence intervals. Future management plans are to increase the population.

(d) Black Bear

The Black bear is found throughout the project area but prefers the brushy and forested areas found in the numerous canyons. Because of hibernation and limited range, it does not follow a seasonal migration. It is omnivorous, and foods include carrion, fresh meat, insects, fruits, nuts, berries, and various plants.

Two areas of concentration were located near the study area. One is in the Dolores River Canyon, 8 miles east of Dove Creek, and the other is in Lost Canyon along the Dolores River east of Dolores.

During the 5-year period from 1969-73, a total of 22 bears were harvested from unit 71, 4 from unit 72, and 4 from unit 73. Although the black bear population, like that of the mountain lion, cannot be estimated precisely with existing techniques, for 1976 the Colorado Division of Wildlife estimates a total population of 175 bears for the three units, with estimates of 75-200 in unit 71, 0-1 in unit 72, and 25-40 in unit 73. Management goals are to stabilize the population, with a slight increase in the western area.

(3) Small Game Mammals

Small game mammals include certain species having sport-hunting qualities. The species inhabiting the project area are the cottontail rabbit, snowshoe hare, Abert's squirrel, and chickaree squirrel.

Two species of cottontail rabbits were found to inhabit areas throughout the project vicinity. The more common is the desert cottontail, found in the more arid lower elevations, generally below 6,000 feet. The mountain, or Nuttall's, cottontail occupies coniferous forest regions between 6,000 and 11,000 feet in elevation. Both species use a wide variety of habitats and are estimated to have an overall average density of eight rabbits per square mile. The highest densities are found north of the town of Cortez, along the Dolores River, and south of the town of Dove Creek. They feed on almost all herbaceous plants, including grasses, sedges, forbs, and shrubs. Both species are nocturnal and active through the year.

The snowshoe hare occurs above 8,000 feet in elevation, and most of its range is outside the project area in the San Juan National Forest. The species is most abundant in or near areas of reduced conifer overstory and dense undergrowth. Like the cottontails, it is nocturnal and active year-round.

The Abert's squirrel is uncommon in the San Juan Mountains, where it is closely associated with pure stands of ponderosa pine. Since this particular habitat is not abundant in the project area, this species can be considered as occasional only at higher elevations.

The chickaree squirrel, although more abundant than the Abert's squirrel, rarely ranges below 6,000 feet. These animals are associated with Douglas fir and spruce in the coniferous forest, but they occasionally range above and below these zones. Although not identified in the study, the chickaree squirrel probably inhabits small, isolated stands of Douglas fir within the proposed McPhee Reservoir site.

(4) Furbearers

Furbearers inhabiting the project area include the beaver, striped skunk, spotted skunk, muskrat, mink, short-tailed weasel, long-tailed weasel, gray fox, ringtail, badger, and kit fox.

The beaver concentrates along the Dolores and Mancos Rivers in the study area. The distribution of the animal is restricted by its food sources, which generally include aspen, willow, and cottonwood. Beaver populations in the area are estimated to be 800. Trapping is relatively light.

The striped skunk is common throughout the area, inhabiting a variety of habitats. Its range in the area is large, extending from the Ute Mountain Ute Indian Reservation to the upper portion of the Dolores River. The spotted skunk occurs in the project in lesser numbers and tends to prefer the canyons and more arid river valleys at lower elevations. The population is estimated at 800 in the study area, primarily in regions south of Dolores.

Suitable muskrat habitat, consisting of streams, lakes, ponds, swamps, and irrigation ditches, is common in the study area. Distributed in the Dolores River Basin from Groundhog Reservoir southward and from Rico to the McPhee Reservoir site, the animals inhabit burrows dug in the streambanks or small lodges constructed of aquatic vegetation and mud. They are estimated to number 640 and are concentrated in marshy areas along Dawson Draw, Narraguinnep Reservoir, Totten Reservoir, Denny Lake (located on the eastern edge of Cortez), and the McPhee Reservoir site.

Mink inhabit areas in and near marshes, ponds, lakes, and streams. Normally active at night, they are carnivorous and may prey on a variety of animals, ranging over great distances in search of food. No specimens were identified during the survey, and the animals are considered to be uncommon in the area, although habitat exists on streams leading into the McPhee Reservoir site from the northeast.

Of the two species of weasel found in the study area, the ermine, or short-tailed weasel, is restricted to the higher elevations in Montezuma and Dolores Counties and prefers coniferous forest and mountain shrub habitats. The more common long-tailed weasel is found in virtually all habitats in the area except very moist ones. Although its range is fairly extensive, areas of concentration are found near the upper portion of the West Dolores River and on both sides of the Dolores River from the McPhee Reservoir site to Dove Creek. An estimated 200 weasels inhabit the study area, most of which are found north of the Dolores River.

The gray fox is fairly common in the project area except at higher elevations, preferring the rough, brushy country associated with pinon-juniper wood land. It tends to concentrate west of U.S. Highway 666 from Cortez to Dove Creek and north of Dove Creek but is also common in Mesa Verde National Park. There are approximately 500 gray foxes in the area.

The ringtail is rarely found in the area. It is known to inhabit hollow trees, cliffs, canyons, and abandoned mines and cabins in arid areas. Although suitable habitat exists in Cross, Yellow Jacket, and Dolores Canyons, the only recorded one has been sighted in McElmo Canyon.

The badger tends to inhabit open grass land, parks, and crop land. Its range is scattered throughout the study area but occurs mostly west of the Dolores River from Pleasant View to the Utah State line. Smaller ranges exist in Mesa Verde National Park, north of Cortez, and in the San Juan National Forest, east of Dove Creek. Badgers number approximately 250, and their status is considered uncommon in the study area.

The kit fox may occur in the project area, having been previously reported in McElmo Canyon and southwestern Montezuma County. It is considered to be extremely rare in Colorado, however.

(5) Varmints

The Colorado Division of Wildlife classifies varmints as mammals which offer favorable opportunities for sport harvest and which sometimes cause significant damage to public property or nuisance to human interest. Species inhabiting the project area include the coyote, raccoon, bobcat, porcupine, jackrabbit, rock squirrel, prairie dog, and marmot.

Coyotes are common throughout the project area, particularly at lower elevations. The coyote is almost entirely carnivorous and is normally active at night. Several concentrations are present in and near the project area, totaling an estimated 900 animals.

Raccoons are most common along streams, ponds, swamps, and irrigated areas. Although they tend to concentrate around Cortez and Mancos, they have also been reported along the lower Dolores River, McElmo Creek, and in the Dove Creek area. Populations are estimated at 500 within the study area.

Bobcats range throughout the study area, with the greatest densities in rough, brushy canyons and draws at lower elevations. They are common along the Dolores River downstream from the town of Dolores. The estimated population of bobcats in the study area is 600.

Porcupines may be found throughout the study area, but they prefer forested areas and are common in ponderosa pine forests and dense stands of pinon-juniper wood lands. They are found throughout the McPhee Reservoir site, in McElmo Canyon, near Mesa Verde Reservoir and around Totten Reservoir.

Jackrabbits in the area include the black-tailed and possibly the white-tailed jackrabbit. The black-tailed jackrabbit is common at lower elevations, inhabiting grass lands, crop lands, and brush lands. The white-tailed jackrabbit is uncommon in the project area, tending to inhabit higher elevations. The population of jackrabbits in the area is estimated at 9,500.

Considered to be locally abundant, rock squirrels are particularly common in rocky areas or along brushy stream bottoms. In the area, they are commonly found along the Dolores River below Dolores and in pinon-juniper wood lands.

The range of the Gunnison's prairie dog in the area covers the western half of the Ute Mountain Ute Indian Reservation and extends west of Mancos to the Utah State line and north of Cortez and Dolores. The animals locate their towns in open grass land, where they feed on grasses, sedges, and forbs. Active only during warmer months, their estimated population in the study area is 22,000, mostly around Cortez and on the reservation.

The yellow-bellied marmot is generally restricted to areas above 6,000 feet in elevation. Suitable habitat consists of rocky outcrops

and talus slopes near mountain peaks, where green forage is available. Due to the elevation requirements, suitable habitat is found only in certain restricted parts of the project area. A population estimated at 500 animals inhabits portions of the upper Dolores River.

(6) Other Nongame Mammals

Nongame mammals in the project area include chipmunks, ground squirrels, pocket gophers, mice, rats, voles, shrews, and bats. These animals are important elements in the ecology of the project area. Over 50 nongame mammals were trapped by the Colorado Division of Wildlife during its inventory. Caught in the vicinity of the McPhee and Dawson Draw Reservoir sites were the deer mouse, Colorado chipmunk, least chipmunk, golden-mantled ground squirrel, and bushy-tailed woodrat.

(7) Gamebirds

Turkeys are found in ponderosa pine forests which support an understory of Gambel's oak and in pinon-juniper wood lands. Two small flocks of approximately 10 birds each are reported in areas east of Dolores, the remnants of a population reduced by disease in 1959.

The ring-necked pheasant is an introduced bird which ranges from the Cortez area to Pleasant View. Preferring farm lands as a habitat and requiring vegetative cover throughout the year, the pheasant populations are known to exist north and south of Cortez, around Totten Reservoir, and in McElmo Canyon. The Colorado Division of Wildlife estimates that 1,500 pheasants inhabit the study area.

The blue grouse, requiring a forest environment in the lower ponderosa pine belt or higher spruce-fir zone, is widely distributed throughout the higher elevations of the project area. Most of the range is north and northeast of Dolores and north of Mancos, with approximately 750 birds in the study area itself.

The sage grouse inhabits areas in the vicinity of Dove Creek and the Great Cut. It is considered to be uncommon in the study area since it is dependent upon a sagebrush environment which is not abundant. No strutting grounds were observed during the studies.

The sharp-tailed grouse inhabits a variety of vegetative types, particularly rougher oakbrush from 7,000 to 9,000 feet in elevation. It is present near Mancos, north of Dolores, and on the National Forest from Dove Creek to Rico. The population is estimated to number 200.

Gambel's quail, which is considered to be uncommon in the area, inhabits warm dry valleys of salt desert shrubs and pinon-juniper wood land. It is present in McElmo Canyon and between Cortez and Towaoc.

The chukar inhabits parts of McElmo and Yellow Jacket Canyons, preferring areas of broken rimrock and dry climate. The populations

are subject to extreme fluctuations but are currently estimated at approximately 600 birds.

The mourning dove inhabits a large range in the study area, seasonally concentrating east of Cortez and from McElmo Creek to Dove Creek, where dry land farming occurs. Seasonal concentration areas are located along the Dolores River, around existing reservoirs, within project reservoir sites, and on all crop lands.

The band-tailed pigeon is a common summer resident of coniferous forests but may also frequent pinon-juniper communities. There are two areas of concentration in the study area: one above Mancos and Dolores, the other west of Cortez and on the Ute Mountain Ute Reservation. Varying from year to year according to food supplies, the pigeon population is currently estimated at 1,500.

(8) Waterfowl and Shorebirds

Waterfowl and shorebirds found in the project area include ducks, geese, loons, grebes, herons, and gulls. The greatest concentrations of waterfowl are on Denny Lake, Totten Reservoir, and Narraguinnep Reservoir, although the use of other reservoirs and small ponds is common. Lack of water and feeding areas is a factor that limits waterfowl and shorebird populations in the project area.

Most species migrate south in the fall to New Mexico, Arizona, and Mexico. A few birds of certain species remain year-round, although most of their population migrates south in the winter. These winter residents include the Canada goose, mallard, gadwall, shoveler, American widgeon, teal, coot, and Franklin's gull. All of the waterfowl and shorebirds are considered common except for the common loon, great blue heron, and black-crowned night heron. Efforts are being made by the Colorado Division of Wildlife to establish a resident goose population.

(9) Raptors

The raptors, or birds of prey, that occur in the project area are eagles, hawks, owls, falcons, osprey, and vultures. The area contains a variety of good habitats for raptors, and areas for resting, hunting, and nesting are enhanced by relative isolation. Concentration and nesting areas have been identified north of Towaoc, east of Cortez, north and east of Dolores, north of Dove Creek, along the Dolores River, and around Narraguinnep and Totten Reservoirs. The birds are attracted to ponds, reservoirs, marshes, and rivers where waterfowl and other prey are present.

Common raptors using the project area include the turkey vulture, red-tailed hawk, rough-legged hawk, Cooper's hawk, kestrel, marsh hawk, Swainson's hawk, great horned owl, northern bald eagle, and golden eagle. Golden eagles and other cliff-nesting raptors may be found along the Dolores Canyon where suitable habitat exists.

(10) Nongame Birds

Nongame birds in the Dolores Project area include passerines, woodpeckers, rock doves, nighthawks, swifts, and hummingbirds. Many of these birds are migrants, nesting in the project area in the summer months. The Dolores River, along with its associated vegetative communities, provides significant habitat for a large number of species. Although several habitats support a variety of birds, the riparian wood land along the Dolores River and other waterways, which is probably the most limited in extent, is utilized by the greatest diversity of species. Next to the riparian community, nongame birds prefer crop land and pinon-juniper wood land.

(11) Reptiles and Amphibians

All of the amphibians and reptiles found within the project area are widespread in the southwestern United States. The most common species observed in the project area include the Great Basin sagebrush lizard, northern side-blotched lizard, and Utah tiger salamander. Species considered to be uncommon include the western leopard frog, two-lined skink, and desert striped whipsnake.

c. Threatened or Endangered Species

Studies by the Colorado Division of Wildlife and the Fish and Wildlife Service have revealed no threatened or endangered species of fish in the project area. An additional study funded by the Fish and Wildlife Service to determine the presence of endangered fish species in the San Juan River was recently completed, and no endangered species were discovered.^{1/}

Although the Colorado Division of Wildlife reported no recent sightings of endangered wildlife species, historical sightings indicate the future possibility of the peregrine falcon in the Dolores River Canyon between the Bradfield Ranch, located approximately 10 miles below McPhee Dam site, and Slick Rock. This area contains excellent nesting habitat.

In a survey of the Ute Mountain Ute Indian Reservation, the Fish and Wildlife Service found signs of the possible presence of the endangered southern bald eagle and black-footed ferret. In compliance with Section 7 of the Endangered Species Act of 1973, the Bureau of Reclamation consulted with the Fish and Wildlife Service and completed studies to determine the status of these species on project lands.

Extensive potential habitat for the black-footed ferret exists on Ute Mountain Ute Indian lands southwest of the town of Towaoc, where essentially all of the proposed 7,500 acres to be irrigated are occupied by Gunnison's prairie dogs. The ferret preys on the prairie dogs and

^{1/} James E. Sublette, "A Survey of the Fishes of the San Juan River Basin, With Particular Reference to the Endangered Species" (Portales, N. Mex.: Eastern New Mexico University), a report submitted to the Fish and Wildlife Service.

inhabits their tunnels. An August 1976 survey was conducted on approximately 2,600 acres of the project land, producing no evidence of ferrets. The large number of prairie dogs and relative remoteness of the area, however, do present the possibility that the black-footed ferret may exist there.^{1/}

The Fish and Wildlife Service report of possible nesting activity of the southern bald eagle on Ute Mountain Ute Indian land was investigated by aerial surveys in July 1976. A search of suitable nesting areas produced no evidence to substantiate this report.

During the 1976 aerial survey, a pair of mature peregrine falcons was located southwest of Cortez. The aerie was not located at that time, but subsequent surveys have located a site tentatively believed to have been used in a nesting attempt.

The grizzly bear is designated as threatened on the Federal list of threatened and endangered species and endangered on the Colorado list. Although project land is within the historical range of this species no evidence of its presence was reported by the Colorado Division of Wildlife or the Fish and Wildlife Service.

The gray wolf, wolverine, river otter, and Canada lynx are also recorded as endangered by the State. The Canada lynx and wolverine inhabit spruce-fir communities similar to that at the headwaters of the Dolores River above the project area. No evidence of these species has been reported in recent studies. The river otter and gray wolf have historical ranges which occur in the project area, yet studies have not revealed their presence.

d. Vectors and Related Problems

The U.S. Public Health Service reported on vectors and related problems of the area in 1961 and 1975.^{2/} Several species of mosquito are common, particularly in marshy seeps along natural drainageways, farm ponds, floodwater pools along the Dolores River, marshy areas south of Cortez, and other areas that collect water. The species Culex tarsalis is a vector for encephalitis, a brain disease of horses and humans and probably the most important vector-borne disease in the project area. Data indicate that this disease has been active in the past and may break out in the future. The Anopheles freeborni is the western vector of malaria and is also common, but the parasite for the disease does not survive the winter in the local climate. Several species of Aedes mosquitoes prevalent in the area are severe biters and may cause health

^{1/} U.S. Fish and Wildlife Service, State Supervisor, Animal Damage Control. Letter to the Bureau of Reclamation, Denver, Colo., August 10, 1976.

^{2/} U.S. Public Health Service, Department of Health, Education, and Welfare, Report on the Public Health Aspects of the Dolores Project, Colorado (November 1961) and letter of April 14, 1975, to the Bureau of Reclamation.

problems for individuals, particularly children, because of secondary infections and allergic reactions. Other mosquitoes, although not posing health problems, may interfere with human activities in local areas.

The Rocky Mountain wood tick, which is common in the area, can transmit Rocky Mountain spotted fever and Colorado tick fever to humans. The tick may also transmit tularemia, but the disease is very uncommon at the present time.

Bubonic plague, like tularemia, is a disease principally of rodents but also capable of affecting humans. In southwestern Colorado, plague organisms have been identified numerous times in fleas from wild animals.

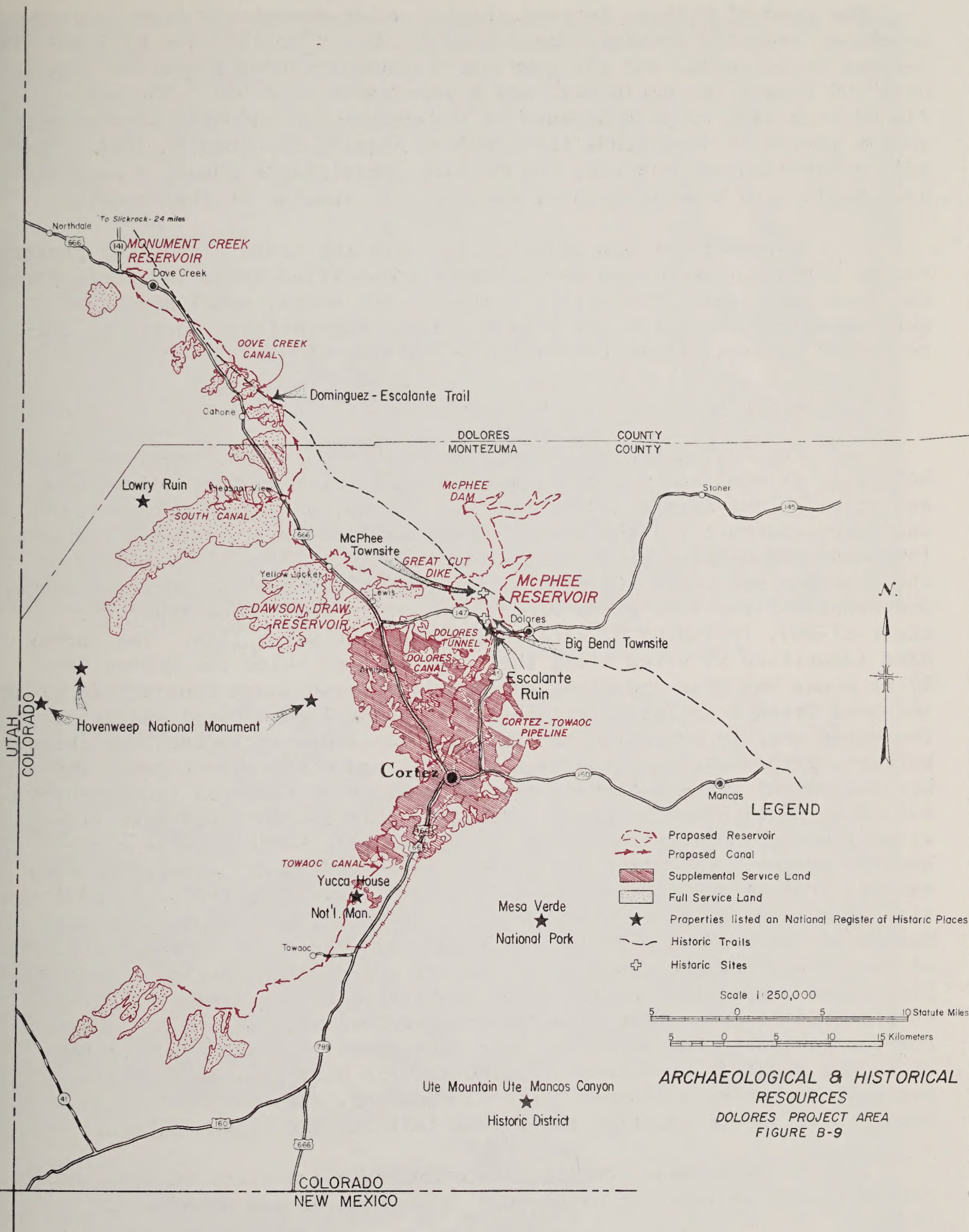
9. Historical and Archaeological Sites

a. Historical

The project area contains the Dominguez-Escalante Trail of 1776 which has been designated for study under the provisions of the National Trail System Act of 1976 (Public Law 94-527) to determine eligibility for inclusion in the system. The trail marks a historic 1,800-mile trip by two Franciscan padres, Fray Francisco Antanasio Dominguez and Fray Silvestre Velez de Escalante, from Sante Fe, N. Mex., northward through western Colorado, across northern Utah, southward through western Utah, and across Arizona back to Sante Fe. This route took them through the Dolores Project area (see Figure B-9). The expedition was intended to discover an overland route between the Spanish missions in Santa Fe and Monterey, Calif. Although unsuccessful in this objective, the exploration was a major contribution to geographic and cultural knowledge of the Southwest and led to the later development of the old Spanish trails between settlements. There is no physical evidence of the trail itself. Its location has been interpreted primarily from a diary Escalante kept during the expedition.^{1/}

The project area contains two sites of local historical interest. Big Bend, the first settlement on the Dolores River, was established in about 1880 2 miles west of the present town of Dolores. The town was named for its location on a broad plain where the river changes its course from west to north. Containing a bank, a blacksmith shop, stores, and other businesses, the town was the population and commercial center of the area until 1891. In that year, the Denver and Rio Grande Railroad entered the Dolores River valley and extended upstream to the mining town of Rico. The present town of Dolores was laid out where the railroad entered the valley, and several buildings, businesses, and the post office were moved from Big Bend to the new townsite. Eventually all of the town was removed. The land was cultivated and is now used as pasture.

^{1/} Herbert E. Bolton, Pageant in the Wilderness: The Story of the Escalante Expedition to the Interior Basin, 1776 (Salt Lake City: Utah State Historical Society, 1972), pp. 29-33.



The town of McPhee, located about 5 miles downstream from Dolores, developed around a sawmill constructed in 1924. By 1929 the mill was the largest in Colorado, and the town had a company store, a post office, over 100 houses for employees, and a population of 1,500. The mill closed from 1932 to 1934 because of the depression and afterward underwent a series of disastrous fires before closing for good in 1948. The mill superintendent's house, the resident physician's house, a concrete bank vault, and a swimming pool are the only remains at the townsite.

As a part of the consultation with the State Historical Preservation Officer, the Bureau of Reclamation submitted State Inventory Forms for both townsites. The office evaluated the sites, concluding that sufficient consideration had been given and that neither meets the criteria for eligibility to the National Register of Historic Places.^{1/}

b. Archaeological

The Four Corners Region of southwest Colorado, southeast Utah, northeast Arizona and northwest New Mexico is rich in the Indian ruins and sites of the Anasazi ("Old Ones"). The University of Colorado, working under contract for the Bureau of Reclamation, inventoried 592 sites, including 310 within the project rights-of-way, 177 in the vicinity of the rights-of-way, and 105 outside the general area of project influence. One hundred-fifty-five sites were found within the McPhee Reservoir right-of-way, including 57 sites below the high water line. The survey also identified 40 sites along the Dolores River below the McPhee Dam, 87 at Great Cut Dike and along the Dove Creek and South Canals, 128 along the Dove Creek area laterals, and 77 along the Towaoc Canal and laterals. The sites vary in extent, with surface indications including rock chips, pottery, pithouses, and remains of pueblos and other structures. The archaeological sites represent past occupation of the area from perhaps 2500 B.C. until historic times. Relatively little work has been previously done, and information on the prehistoric habitation is consequently meager. The sites are classified according to cultural periods ranging from about 2500 B.C. to A.D. 1350. (see Table B-6). In addition, six sites presumed to be of historical age were found, consisting primarily of Ute or Navajo Indian sweat lodges. Table B-7 contains a list of the sites according to project feature and cultural period. Six properties containing Anasazi ruins are listed on the National Register of Historic Places: Escalante Ruins (recently restored and now managed for the public by the Bureau of Land Management), Mesa Verde National Park, Ute Mountain Ute Mancos Canyon Historic District, Yucca House National Monument, Hovenweep National Monument, and Lowry Ruin.^{2/} Their locations in relation to project features are shown on Figure B-9.

^{1/} Correspondence from the State Historical Society of Colorado to the Bureau of Reclamation dated July 7, October 7, and November 21, 1975.

^{2/} Federal Register, Vol. 41, No. 28 (February 10, 1976), and all monthly supplements.



Figure B-10--Basketmaker III site within a small alcove. Remnants of at least two pithouses are evident.



Figure B-11--Historic site consisting of an Indian sweat lodge constructed of planks (probably rough pine).

Table B-6
Archaeological and historic periods and characteristics
Dolores Project area

Cultural period	Characteristics
(2500 B.C. - A.D. 1)	Evidence that man was hunting and perhaps living year-round in the McPhee area by at least 2500 B.C. Tools and other artifacts predominantly of stone. None of these early sites has been excavated.
Basketmaker II (1 - A.D. 500)	Tools and other artifacts of stone, baskets, seminomadic hunters. Agriculture begins late in the period.
Basketmaker III (500 - A.D. 750)	Baskets, fired pottery, farming, small villages of pit-houses with nearby storage facilities.
Pueblo I (750 - A.D. 950)	Continuation of large pithouses, beginning of surface habitations, red ware pottery, textural manipulation in cooking pots.
Pueblo II (900 or 950 - A.D. 1150 or 1200)	Masonry surface villages, new styles of pottery, supplementary features such as sewers and irrigation check dams.
Pueblo III (1150 or 1200 - A.D. 1300 or 1350)	New styles of pottery, larger pueblos, climax of the Anasazi culture.
Historic Sites	Evidence of occupation by Ute and Navajo Indians and homesteaders. The sites are primarily sweat lodges and lithic scatter.

Table B-7
Historical and archaeological resources^{1/}
Dolores Project

Locations	Cultural periods ^{2/}	Number of sites
McPhee Reservoir		
Within maximum water surface	BM II	2
	BM II	4
	BM III, P I	12
	BM III, P II	3
	P I	12
	P II	2
	P I, P II	9
	P II, P III	1
	Undetermined	12
Within right-of-way	BM II	1
	BM III, P I	20
	BM III, P II	1
	P I	7
	P II	11
	P I, P II	9
	P II, P III	1
	Undetermined	18
On or near edge of right-of-way	P II	1
	P I, P II	1
Subtotal		<u>155</u>
Dolores River Canyon below McPhee Dam ^{3/}		
Within right-of-way	BM II, P I	6
	P I	5
	P II	1
	P I, P II	5
	Undetermined	10
On or near edge of right-of-way	BM III, P I	1
	P I	1
	P I, P II	1
	Undetermined	3
Outside right-of-way	BM III, P I	2
	P I	2
	P II	1
	Undetermined	2
Subtotal		<u>40</u>
Great Cut Dike, Dove Creek, and South Canals (including pumping plants)		
Within right-of-way	BM III, P I	1
	P I, P III	1
	Undetermined	1

^{1/} See bibliography on last page of table.

^{2/} BM = Basketmaker, P = Pueblo.

^{3/} To Williams Draw (about 10 miles below the dam).

Table B-7 (Continued)
Historical and archaeological resources^{1/}
Dolores Project

Locations	Cultural periods ^{2/}	Number of sites
On or near edge of right-of-way	BM III, P I	20
	BM III, P II	2
	P I	3
	P II	2
	P I, P II	2
	Historical	1
	Undetermined	7
Outside right-of-way	BM III	1
	BM III, P I	19
	BM III, P II	4
	BM III, P III	1
	P I	4
	P II	4
	P III	1
	P I, P II	3
	P II, P III	2
	Historical	2
	Undetermined	6
Subtotal		<u>87</u>
Dove Creek area laterals		
Within right-of-way	BM III, P I	1
	P I	1
	P II	2
	P I, P II	3
	P I, P III	1
	P II, P III	3
On or near edge of right-of-way	BM III, P I	3
	P I	2
	P II	9
	P III	2
	P II, P III	5
	Historical	1
	Undetermined	5
Outside right-of-way	BM III	1
	BM III, P I	17
	P I	19
	P II	24
	P III	2
	P I, P II	2
	P II, P III	11
	Undetermined	14
Subtotal		<u>128</u>

^{1/} See bibliography on last page of table.

^{2/} BM = Basketmaker, P = Pueblo.

^{3/} To Williams Draw (about 10 miles below the dam).

Table B-7 (Continued)
Historical and archaeological resources^{1/}
Dolores Project

Locations	Cultural periods ^{2/}	Number of sites
Towaoc Canal and laterals		
Within right-of-way	P I	1
	P II	6
	P I, P II	1
	P II, P III	2
	Undetermined	2
On or near edge of right-of-way	BM III, P I	2
	P I	1
	P II	15
	P III	2
	P I, P II	2
	P I, P III	2
	P II, P III	6
	Historical	
	Undetermined	9
Outside right-of-way	BM III, P I	1
	P I	2
	P II	9
	P III	1
	P I, P II	1
	P II, P III	5
	Historical	1
	Undetermined	5
Subtotal		<u>77</u>
Total		<u>487</u>

^{1/} Sources: Allen E. Kane, Archaeological Resources in the Great Cut Dike-Dove Creek Area, Dolores River Project: Report of the 1974 Season, 2 vols. (University of Colorado: May 1975).

Allen E. Kane, Archaeological Resources of the Dolores River Project: Report of the 1975 Field Season, (University of Colorado: Mesa Verde Research Center, December 1975).

David A. Breternitz, Archaeological Resources of the Towaoc Canal and Laterals, Dolores River Project, Colorado, (University of Colorado: Mesa Verde Research Center, September 1975).

David A. Breternitz and Martin W. Daniel, Report of the Dolores River Project Archaeological Reconnaissance, 1972-1973, 2 vols. (University of Colorado Archaeological Research Center, December 1973).

Henry W. Toll, III, Archaeological Resources in the Dolores River Canyon Below the Proposed McPhee Reservoir; Montezuma, Dolores, and San Miguel Counties, Colorado, (University of Colorado, December 1974).

10. Land Ownership

Montezuma and Dolores Counties contain just over 2,000,000 acres, as shown in Table B-8, consisting of 1,074,900 acres of private land (including the Indian Reservation) and 925,600 acres of public land. Most of the National Park Service land lies within Mesa Verde National Park, with smaller amounts in Yucca House and Hovenweep National Monuments. The 605,000 acres of Forest Service land comprise about one-third of the total San Juan National Forest in southwestern Colorado, with the bulk of the forest lying to the east. State and local governments, which own less than one percent of the total area, have leased most of their land to farmers and ranchers. The Ute Mountain Ute Indian Reservation, in addition to its 433,000 acres in Montezuma County, contains 107,500 acres in New Mexico and 13,500 acres in Utah.

Table B-8
Land ownership

	Montezuma County	Dolores County	Total
Private	375,700	266,200	641,900
Indian	433,000		433,000
Bureau of Land Management	209,300	42,200	251,500
Forest Service	260,200	345,400	605,600
National Park Service	51,800		51,800
State and local governments	11,900	4,800	16,700
Total	1,341,900	658,600	2,000,500

The proposed project rights-of-way, as stated in Chapter A, contain 12,037 acres of private land and 6,222 acres of public land (nearly all located at McPhee Reservoir). The public land has been withdrawn by the Bureau of Reclamation, which essentially prohibits uses not consistent with project purposes. Figure A-17 shows the distribution of land ownership at the site of the McPhee Reservoir.

11. Scenery

The project area is located in a basically rural setting, marked by clear air, generally unobstructed views, and a wide variety of scenery. In the broad, undulating terrain of the Dove Creek area, isolated patches of native vegetation break the formal patterns of the extensive farm lands, contrasting with the red soil and the long rows of crops. The scattered farmsteads, generally located in clusters of trees, also provide occasional breaks in the terrain and add to the sense of perspective. To the southwest, the broad ridges gradually narrow into fingers separated by deeply cut canyons of pinon and juniper, the farm land running in small strips along the top. To the north the land rises gradually, then drops abruptly into the Dolores River Canyon, where the wooded slopes with occasional rock outcrops, the dense riparian vegetation, and the occasional bottom land pastures create an area popular for scenic drives.

Montezuma Valley is also an agricultural area, characterized by pastures, livestock, brush fence rows, occasional orchards, and farmsteads.

The valley gradually narrows toward the south, closed in by the pinon- and juniper-covered slopes of Sleeping Ute Mountain on the southwest and the long escarpment of Mesa Verde on the southeast. When viewed from an area east of Cortez, the mountain forms the profile of a man lying on his back with arms crossed, a resemblance which has given it a place in the legends of the Ute Mountain Ute Indians.

To the south of Montezuma Valley, forms typical of the southwestern desert dominate the landscape. Austere and intensely eroded, the area is marked by contrasting lines. The horizontal impressions of flat-topped mesas, terraces, plains, valley floors, and exposed rock strata are strongly set off by the vertical emphasis of cliffs, rock chimneys, and deep canyons. The dry climate and imposing terrain have effectively limited development in such areas, and much of the land remains unaffected by man.

12. Economic and Social Conditions

a. Population

The U.S. Bureau of the Census reported a 1970 population of 12,952 for Montezuma County and 1,641 for Dolores County. The populations of the major communities were 6,032 for Cortez, 1,107 for Towaoc, 820 for Dolores, and 619 for Dove Creek. The rural population is distributed primarily in the irrigated portion of Montezuma County near Cortez and along U.S. Highway 160 between Cortez and Dove Creek.

The population is composed primarily of Caucasians (including 1,473 Spanish-Americans in Montezuma County) and Indians. The Indian population is largely concentrated on or near the Ute Mountain Ute Indian Reservation. A breakdown of the census is shown in Table B-9.

Table B-9
1970 population by race^{1/}

	Montezuma County	Dolores County
Caucasian	11,828	1,473
Indian	1,054	155
Blacks	14	
Other	56	13
Total	12,952	1,641

^{1/} 1970 U.S. Census.

The growth of the two counties from 1930 to 1975 is shown in Table B-10. A large increase from 1950 to 1960 resulted primarily from a boom in oil and uranium exploration, which brought about a substantial immigration. This activity dropped sharply between 1960 and 1970, producing a general decline in the total population, and the town of Dolores was the only community in the area that continued to grow during this period. Much of the general decline occurred among the youth of the area because of a high degree of independence among high school graduates and a failure of the local economy to provide adequate employment. Although the total population for the two counties decreased, a

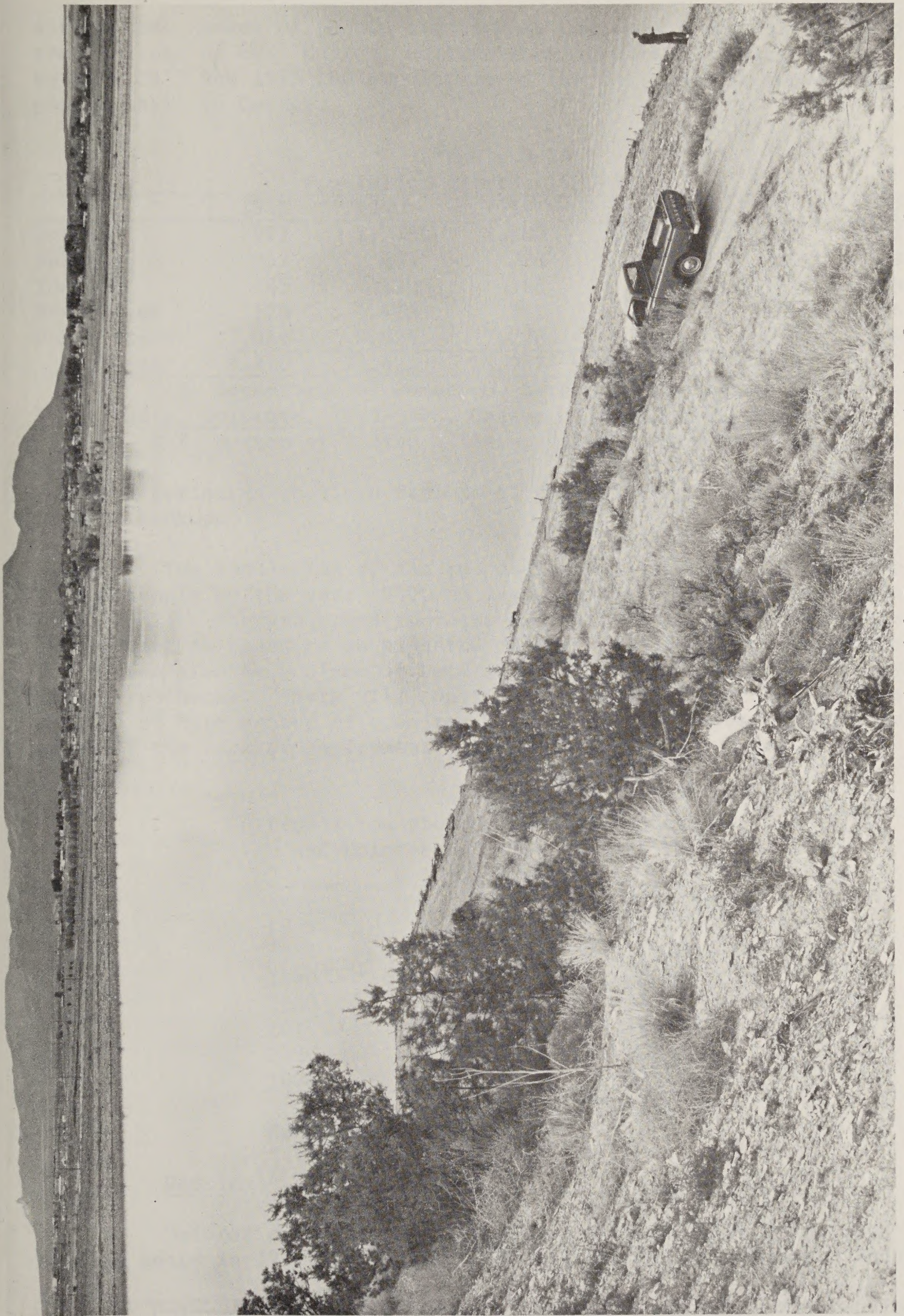


Figure B-12--Sleeping Ute Mountain with Totten Reservoir in foreground.

significant number of people migrated to the area, particularly people over the age of 60. Current estimates of population indicate that between 1970 and 1975 the population of the two counties increased, particularly in Cortez.

Table B-10
Population growth, 1930-75^{1/}

	1930	1940	1950	1960	1970	1975 ^{3/}
Cortez	921	1,778	2,680	6,764	6,032	7,278
Dolores	557	804	729	805	820	970
Towaoc ^{2/}	485	493	568	813	1,107	1,301
Dove Creek	178	418	702	986	619	625
Other areas	7,069	8,928	7,278	6,852	6,015	6,601
Total	9,210	12,421	11,957	16,220	14,593	16,775

^{1/} U.S. Department of Commerce, Bureau of the Census, Number of Inhabitants, Colorado, 1939-1970, Census of Population, Washington, D.C.

^{2/} U.S. Bureau of Indian Affairs, Ute Mountain Ute Tribe, Towaoc, Colo.

^{3/} Estimates obtained from local and county government, based on utility hookups.

The population of the two counties is expected to increase by 20,700 people by the year 2030, an annual increase of 1.5 percent (see Table B-11). The projected increase over the historical annual rate of 1.3 percent is based on an expected expansion of tourism, the desirability of the area as a place of retirement, and the development of nearby energy resources. Youth will continue to migrate from the area upon completion of high school or upon reaching an age of 16 years and older because of the lack of employment opportunities.

Table B-11
Population projections for Montezuma
and Dolores Counties without the
Dolores Project^{1/}

Year	Population
1975	16,775
1980	17,480
1990	22,400
2000	26,100
2010	29,570
2020	32,280
2030	37,460

^{1/} Estimated by the Bureau of Reclamation.

b. Housing^{1/}

Dolores and Montezuma Counties contained 5,046 year-round housing units in 1970, including 4,335 single-unit structures. About 65

^{1/} Colorado Division of Housing, Colorado Housing: Current Inventory and Needs, Vol. II (Denver: January 1, 1972).

percent of the units were occupied by owners, 24 percent were occupied by renters, and 11 percent were vacant. There were 758 vacancies, of which 581 were year-round and 177 were seasonal or migratory. About 42 percent of the year-round vacancies were for sale or rent. About 12 percent of all of the housing units lacked all or some plumbing facilities. 632 units, more than one person occupied each room.

The housing inventory has grown very slowly in recent years. The total increase in units was 425, consisting of 348 mobile houses brought into the area, 45 single-family units, and 32 units in apartment complexes.

Between 1975 and 2030, if the project were not built, approximately 20,700 additional people would require housing. With a two-county average of 3.2 persons per family, 6,500 new housing units would be needed. Although the existing vacancies in the area may at first meet part of this demand, a large number of vacant units should be replaced by 2030. The Colorado Division of Housing has estimated a total replacement requirement of nearly 410 units between 1970 and 1975.^{1/}

c. Employment and Incomes

As part of the Four Corners Economic Development Region, which is characterized by depressed personal incomes and a persistently high rate of unemployment, the entire project area is eligible for public assistance under the Public Works and Development Act of 1965. According to the U.S. Department of Labor, unemployment in Montezuma and Dolores Counties was 5.9 percent in 1974, somewhat higher than the State average of 3.8 percent and the National average of 5.6 percent. The problem is particularly severe among the Ute Mountain Ute Indians, where the 1973 rate of employment was 38.4 percent and the 1975 rate of unemployment was 62.1 percent of the Indian labor force. Although comprising only about 7 percent of the population in the counties, the Indians account for 50 percent of the total unemployment. About 13 percent of the Spanish-American labor force was unemployed in 1974.^{2/}

Per capita incomes in the area averaged only \$3,904 in 1974, well below the State and National averages of \$5,514 and \$5,449, respectively. The most limited incomes occurred in rural areas, particularly within the Indian and Spanish-speaking populations. The average per capita income of Indians living on the reservation amounted to \$2,125 in 1974, including a payment of \$1,000 from the tribal fund to each member of the tribe. The average per capita income for Spanish-Americans was \$1,693 in 1970.^{3/}

The 1970 census reported that 14.2 percent of all the families in the area had incomes below the poverty level, a depressed condition

^{1/} Colorado Division of Housing.

^{2/} Colorado Division of Employment and Bureau of Indian Affairs.

^{3/} 1970 U.S. Census and Bureau of Indian Affairs.

when compared to the State figure of 9.1 percent and the National figure of 12.2 percent. More than 40 percent of the Indian population presently lives at or below the poverty level.^{1/}

d. Welfare

Welfare participation, including use of food stamps, decreased approximately 14 percent in Dolores and Montezuma Counties from 1971 through 1975. The part of the population receiving public assistance of some kind decreased from 9.2 percent in 1971 to 7.9 percent in 1975. During this same period, however, nonwelfare food stamp participants increased by 51.7 percent, from 5.8 to 8.8 percent of the total population. Comparable State data are not available.

e. Industry

(1) Retail and Wholesale Trade^{2/}

Retail trade, with approximately 950 employees in 1970, is the largest employer in the area, occupying about 21 percent of the the total work force. Total sales increased from \$40.7 million in 1972 to \$57.1 million in 1975. Although part of the increase was caused by inflation, most was attributed to an increase in sales volume. Trade has tended toward increasing centralization in the city of Cortez, and retail employment in Dolores County has declined dramatically since 1967. In terms of dollar value, the largest sales occur in the automotive and food sectors, followed by general merchandise and public utilities.

Wholesale trade employed 139 persons in 1970 or approximately 3 percent of the work force. Wholesale sales increased from \$4.3 million in 1972 to \$7.0 million in 1975.

(2) Government

The government, including public education, is the second largest employer in the area, with permanent employment of about 770 persons in 1970 (17 percent of the work force). Additional basic employment occurs during the summer as a result of the influx of tourists. The largest seasonal employment occurs at Mesa Verde National Park which added 120 temporary employees in 1975, with smaller increases in the U.S. Forest Service and county and municipal governments.

(3) Agriculture

(a) General Conditions

Irrigated agriculture and dry farming rank third in employment in the project area, totaling approximately 500 employees

^{1/} 1970 U.S. Census and Bureau of Indian Affairs.

^{2/} Colorado County and City Retail Sales by Stand Industrial Classification, Business Research Division, Graduate School of Business Administration, University of Colorado, Boulder, Colo.

(approximately 11 percent of the work force). The inclusion of related retail and wholesale business would increase this figure. Direct employment in agriculture is beginning to decline slightly as increased technology allows farmers to increase their farm size and to reduce the number of laborers required.

The value of crop production increased from approximately \$5,697,000 in 1970 to \$12,244,000 in 1974.^{1/} Livestock and livestock products, particularly cattle, are becoming increasingly more important in the agricultural economy of the area. The number of cattle increased from about 35,000 in 1969 to 46,000 in 1974. In contrast, the number of sheep has remained relatively constant at 37,000, and poultry and hogs have declined consistently in numbers during the past 25 years.^{2/}

About 37,500 acres in the Montezuma Valley area are presently developed for irrigated agriculture, and the water supply is obtained from the Dolores River under the administration of the Montezuma Valley Irrigation Company. Water is distributed by an extensive canal and lateral system. The major enterprise is beef cattle, and the major crops raised for livestock feed are alfalfa, wheat and other small grains, pasture, and corn for silage. Commercial fruits and vegetables are also grown, but are of minor economic importance.

The project area contains about 62,000 acres that are dry farmed for pinto beans and wheat. The town of Dove Creek, in fact, calls itself the "Pinto Bean Capital of the World." Very small amounts of hay and grains other than wheat are also produced in the area.

The Towaoc area on the Ute Mountain Ute Indian Reservation has approximately 100 acres under cultivation. Little water has been available for irrigation, and precipitation is insufficient for successful dry farming.

(b) Agricultural Chemicals^{3/}

Weed control is limited to irrigated and dry-farmed grain fields, areas along irrigation ditches and canals, and patches of bindweed and canadian thistle in dry-farmed areas. Although use of herbicides to control mustard weed in grain and broad-leaved weeds in corn has been increasing, the only significantly used herbicide is 2,4-D in small grains, which amounted to about 295 pounds on approximately 1,179 acres. This herbicide is not persistent and is of low toxicity to animals. Atrazine and tordon, which can also be used for weed control,

^{1/} Colorado Department of Agriculture, Cooperating with the USDA Statistical Reporting Service, Colorado Agricultural Statistics, 1970-1975 (Denver, Colo.)

^{2/} U.S. Dept. of Commerce, Census of Agriculture, Colo., 1949, 1959 1964, 1969, and 1974 (Washington, D.C.)

^{3/} Estimates of chemicals taken from the 1971 farm management survey of the Dolores Project area and the U.S. Department of Commerce, 1969 Census of Agriculture (Washington, D.C.).

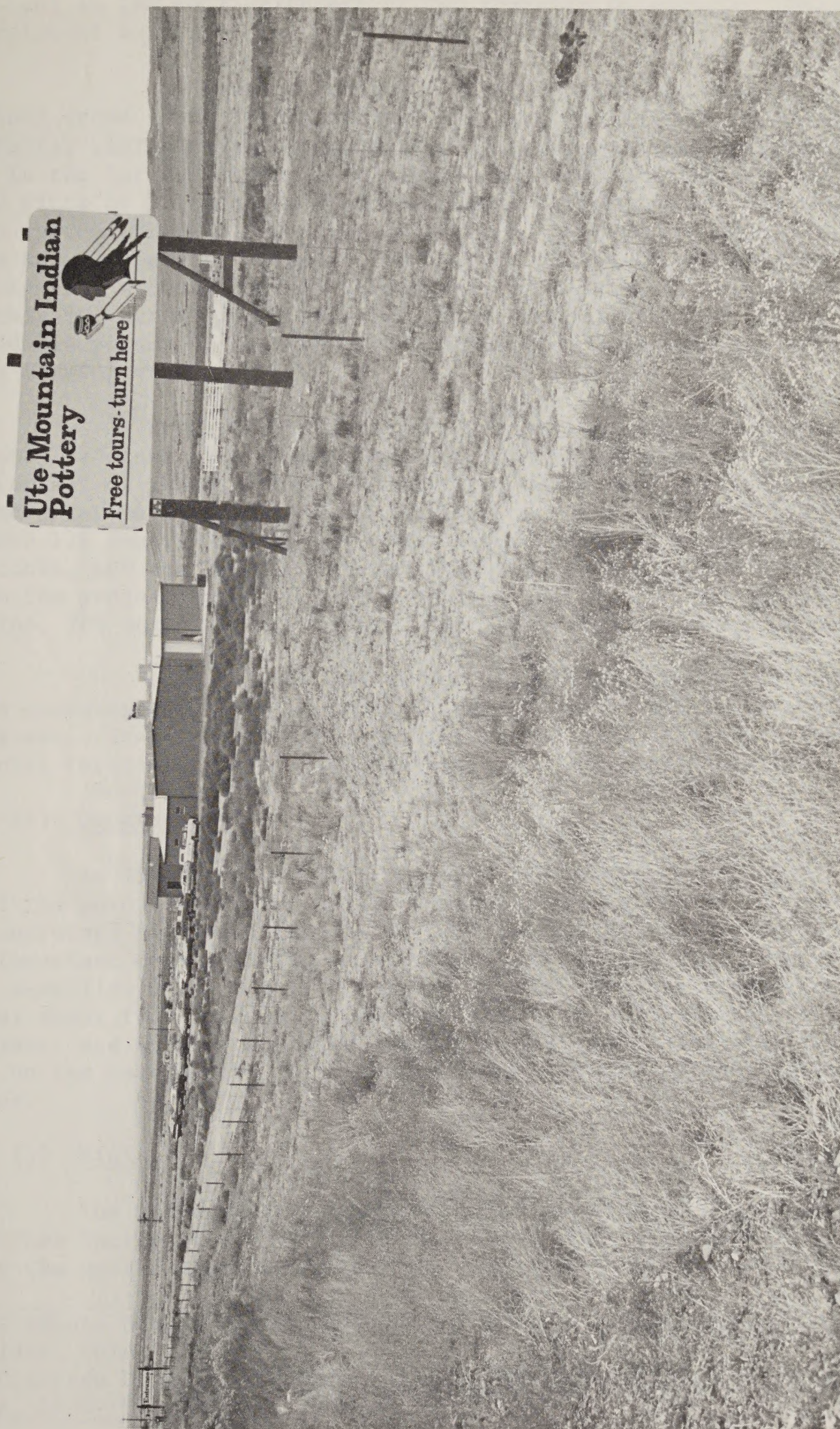


Figure B-13--Ute Mountain Ute Indian pottery enterprise at Towaoc.

are persistent in the soil, although of low toxicity to animals. Banvel-D is not persistent and is of low toxicity to animals.

The need to control insects is directly related to the principal crops grown in the project area and the insects that infest them. Alfalfa, representing approximately 52 percent of the irrigated cropland, is the largest requiring a significant amount of pesticides, with 5,000 pints of Furadon and 2,500 pounds of Parathion used for weevil control on approximately 5,000 acres of alfalfa. Parathion, highly toxic to animals and persistent for only 3 to 5 days, is usually applied by ground equipment, although aerial application is used on a limited basis. Approximately 107 acres of orchards have been treated with 160 pounds of Guthion and 214 pounds of Diazinon. No measurable pesticides are used in the dry farming area.

Present annual use of chemical fertilizers amounts to approximately 814 tons of phosphate and 344 tons of nitrogen. Alfalfa accounts for all of the 814 tons of phosphate, while small grains, corn silage, and rotation pasture utilize nitrogen at the rate of 121 tons, 97 tons, and 126 tons, respectively. The exact number of acres fertilized is unavailable, but the 26,300 acres of irrigated land that would receive water from the project includes 13,676 acres of alfalfa, 5,260 acres of small grains, 789 acres of corn silage, and 3,945 acres of rotation pasture.

Laws banning the use of certain pesticides and herbicides have encouraged the use of those which are less residual but still somewhat toxic. It is anticipated that this trend will continue. The use of commercial fertilizers will also increase, but not significantly.

(4) Manufacturing^{1/}

In 1970 manufacturing employed 340 people, or about 8 percent of the work force. The value of manufactured goods in the two counties decreased from \$4.1 million in 1972 to \$2.5 million in 1975. The most important manufacturing enterprises have been in wood products, including sawmills, and a match factory in Mancos. Dry ice production and several small food processing operations such as a flour mill, a packing plant, and a dairy are also located in the area. The only manufacturing on the reservation is a pottery plant operated by the Indians near Towaoc.

(5) Mining

The mining industry has declined recently in Montezuma County but has increased in Dolores County since 1970, with lead and zinc being the most important products.^{2/} The eastern half of Dolores

^{1/} Graduate School of Business Administration, University of Colorado, Boulder, Colo.

^{2/} Colorado Division of Mines, Annual Summaries of Mineral Industry Activities, 1930-1974 (Denver, Colo.)

County has relied particularly on the mining industry, thereby experiencing the fluctuations connected with a purely mining economy. Mineral production has been far less important in Montezuma County, having a very minor influence until the mid-1950's, when the discovery of oil and natural gas fields and the beginning of a substantial sand and gravel operation caused increased activity. The finding of oil led to extensive exploration and wildcatting, with production reaching a peak in 1965. Production decreased substantially by 1970, and exploration for new oil and gas reserves has almost stopped. Approximately 300 people, or 7 percent of the work force in the two counties, were engaged in mining in 1970.

f. Recreation and Tourism

Recreation and tourism are an important part of the economic base of the area, which contains such recreational attractions as mountains, streams, reservoirs, and archaeological sites. Among the popular recreation activities are picnicking, sightseeing, backpacking, camping, hiking, horseback riding, boating, hunting, and fishing. Over half of the participants reside outside the area.

A major factor in the many opportunities for outdoor recreation is the large amount of public land in the area. About 46 percent of the 2 million acres in Dolores and Montezuma Counties is publicly owned as the following table shows.

Table B-12	
<u>Land ownership Dolores and Montezuma Counties</u>	
	Percent of area
Private	32
Ute Mountain Ute Indians	22
State and local government	Negligible
Forest Service	30
Bureau of Land Management	13
National Park Service	3
Total	100

The San Juan National Forest, offering a mountainous environment with high peaks and extensive forest, received approximately 1,701,000 visitor-days of use within the two counties in 1975.^{1/} The Forest Service has constructed six campgrounds in the counties, with a total of 100 units and two picnic grounds with 7 units. A small ski area is operated by a Forest Service concessionaire at Stoner northeast of Dolores and is used primarily on weekends by local residents.

Mesa Verde National Park contains well preserved prehistoric cliff dwellings, protected wildlife, and undisturbed vegetation. Annual visitor use is about 600,000 days and reached 615,000 in 1975. The Ute Mountain Ute Indian Tribe is developing a Tribal park that will feature a large number of Indian ruins similar to those at Mesa Verde. Adjoining

^{1/} A visitor day is equivalent to one person visiting for 12 hours.

the National Park on the south, the development will include campgrounds, a visitor center, trails, and other facilities.

Most of the tourists spend money at service stations, hotels and motels, restaurants, curio shops, and grocery stores. Studies by the State of Colorado and the Denver Research Institute at the University of Denver indicate that the average visitor to the State spent \$10 daily in 1968 and \$16 daily in 1975. The figures indicate that visitors to Mesa Verde National Park and the National Forest could have spent as much as \$37,056,000 in 1975.

The Bureau of Land Management (BLM) administers over 250,000 acres of land within the two counties. Although there are no developed areas, the land provides opportunities for hunting, fishing, hiking, and sightseeing. Lowry Ruin, a National Historical Landmark managed by the BLM, receives over 2,000 visitors annually. Escalante Ruins, another National Historic Landmark managed by BLM, is presently being developed as part of the Bicentennial effort.

Hunting use in game management units 71, 72, and 73 is estimated at 97,680 man-days for 1975.^{1/} Fall hunting for deer and elk was about 52,600 man-days, with a large portion due to nonresidents. Small game and waterfowl hunting was limited primarily to residents and amounted to about 12,000 man-days. Other hunting use was 4,170 man-days for bear, 22,190 man-days for varmints, and 6,720 man-days for game birds other than waterfowl. Fisherman use in the counties was estimated at about 142,300 man-days in 1975.^{2/}

Rafting and kayaking on the Dolores River have rapidly become very popular during spring runoff, particularly on the stretch from Williams Draw to Bedrock. Formal classification and inclusion of the Dolores River in the Wild and Scenic River System by Congress as a result of the study referenced in Chapter A could be expected to further increase recreational use of the river. Recreation reached a peak of an estimated 3,200 boater-days for 1976. The most intensive use was 270 boaterdays during the Memorial Day weekend, which the BLM considers to be the carrying capacity of the river according to good land- and water-use practices. Boating use normally occurs from the middle of April through the end of June, with the largest use occurring during late May and early June. Earlier use is less because of low air and water temperatures, and later use is less because of subsiding runoff. Estimates of average annual boating opportunities and use, based on runoff during the 46-year project study period, are shown in Table B-13.

^{1/} Colorado Division of Wildlife Annual Surveys - 1975.

^{2/} Soil Conservation Service, U.S. Department of Agriculture, An Appraisal of Outdoor Recreation Potentials in Dolores and Montezuma Counties (May 1970).

Table B-13
Average boating use
Dolores River

Occurrence	Launching days ^{1/}	Boater days ^{2/}
April 15-30	11.3	122
May 1-20	14.6	394
May 21-June 20	16.3	1,986
June 11-30	10.4	280
July 1	2.0	22
Total	54.6	2,805

^{1/} Riverflow at McPhee Dam of 500 second-feet or greater from snowmelt runoff. Does not include short-term high flows from summer thunderstorms.

^{2/} A boater day is defined as one person boating for any significant amount of time during a launching day.

During the 46-year period, boating opportunities occurred in nearly every year (only 2 years had none), although the opportunities were severely limited in about one out of every 5 years. Flows were insufficient during the latter part of June in 13 years and during July in 38 years.

During the summer months, employment is significantly above that of winter. Because of the influx of summer tourists, large numbers of employees, usually students, are added to the work force. The seasonal nature of tourism and other major occupations, however, causes problems of unemployment and underemployment during the winter months. The Cortez Chamber of Commerce estimates that during the winter employment is down by as much as 50 percent.

g. Facilities and Services

(1) Education

The two counties have a total of 20 schools in operation, including 4 senior high schools (in Mancos, Cortez, Dolores, and Dove Creek), 12 elementary schools, and 4 junior high schools. A special education school is located in Cortez, a combined junior and senior high school is located in Dolores, and a technical college is located on Highway 160 between Mancos and Cortez. The nearest institution of higher education is Fort Lewis College in Durango. In 1972, the area had 4,410 students and 203 teachers for a student-teacher ratio of 22 to 1.

Public schools located in Dolores County are operating near capacity. Most of the structures are old and should be replaced or expanded for long-term future growth. In Montezuma County the schools are newer and can sustain growth in the near future but should be expanded for long-term growth.

(2) Police and Fire Protection

The Colorado State Patrol covers Montezuma and Dolores Counties through an office in Cortez. Police protection is also provided by the Montezuma and Dolores County Sheriff's Departments, and by local forces in Cortez, Dove Creek, Dolores, Towaoc, and Mancos (about 15 miles east of Cortez). Volunteer groups available in the event of emergencies include a search and rescue team in Dolores County and the Ute Mountain Citizen Band Club.

Fire stations are located in Cortez, Dove Creek, Dolores, Pleasant View, and Lewis. Their services extend into the rural areas. The Ute Mountain Ute Indians maintain a small fire department, with a chief and two or three men, at Towaoc.

Police and fire protection in most of the communities should be expanded to keep up with future population growth. Existing fire departments cover large geographical areas but are able to meet emergencies through the cooperation of rural and urban departments.

(3) Water and Sewage

Cortez, Dove Creek, Mancos, and Dolores all have public water systems. Most homes in the rural areas, particularly in the dry-farm areas, have cisterns which they fill periodically by hauling water from the nearest public source. Rural homes must also provide their own disposal systems, such as some combination of a cesspool, holding tank, and drainage field.

To accommodate any future growth, additional water supplies must be developed for municipal and industrial use. The towns of Cortez, Dove Creek, and Towaoc and the rural areas could obtain future supplies by jointly providing storage on the Dolores River and diverting the stored water into the San Juan River Basin under a contract with the Montezuma Valley Irrigation Company. Additional treatment facilities, trunk lines, and distribution lines would be required.

(4) Transportation

The main roads in the area are U.S. Highways 160 and 666 and four Colorado State highways. The heaviest traffic occurs on U.S. Highway 160 south of Cortez in Montezuma County and on U.S. Highway 666 in Dolores County. County roads, most of which are gravelled, provide general access, and are generally under the Federal Aid to Secondary Roads System.

At the present time, Continental Trailways Bus Line provides regular but infrequent service to Dove Creek, Cahone, Cortez, Dolores, and Mancos. Service to cities outside the area goes in all directions but south. Both Dolores and Montezuma Counties are served by a single public airport, which is located just south of Cortez. West Air and Frontier Airlines provide daily airline passenger service to

major cities in Colorado and neighboring States. A private airport is located in Dolores County near Dove Creek.

The area has no railroad service. Livestock and other agricultural products which are shipped out of the area are hauled by trucks.

(5) Health Facilities

Health facilities in the project area are located in Cortez, Dove Creek, and Dolores. Cortez has a 63-bed hospital, a 60-bed nursing home, and clinical facilities. Dove Creek has a clinic with a doctor who is available for services one day each week, and Dolores also has a clinic. Medical needs in the area are also met by a small medical clinic in Mancos and by facilities in Durango, 45 miles east of Cortez.

h. Public Finance and Tax Base

Total expenditures for the governments of Dolores and Montezuma counties amounted to about \$3,491,800 in 1975, an increase of 53 percent over the 1971 expenditures of \$2,282,400. The expenditures have been growing at a rate of more than 10 percent annually during the last 4 years. The largest annual expenditures are for highways and public welfare.

The two counties had total revenues of \$2,301,400 in 1971 and \$3,294,800 in 1975, for an annual increase of about 9 1/2 percent. Over 60 percent of the total revenue came from state funds, and 28 percent came from property taxes.^{1/}

The assessed valuation of the area grew at an annual rate of approximately 3 percent during the 15-year period from 1960 through 1975, increasing from \$26,668,000 to \$41,354,000. There was, however, a decrease in assessed valuation for the years 1961 through 1964. The valuation is expected to continue growing at about 3 percent annually over the long term. Table B-14 summarizes the estimated valuations through 2030.

Table B-14	
<u>Future assessed valuation without the project</u>	
<u>Year</u>	<u>Assessed valuation</u>
1975	\$41,354,000
1978	44,861,000
1980	47,593,000
1990	63,962,000
2000	85,960,000
2010	115,522,000
2020	155,253,000
2030	208,644,000

^{1/} State of Colorado, Department of Social Services, Denver, Colo.

i. Cultural Values

A wide range of cultural values is represented in Montezuma and Dolores Counties. The population consists of Anglos (including the traditional farming population and new groups of retired people who have moved into the area), Indians, and Spanish-Americans.

The Indians, even though they have adopted many elements of the farming and ranching culture, have in the past remained separate from the Caucasian population of the area. Most of the Ute Mountain Utes prefer to maintain their cultural identity. They still hold ceremonies such as the Bear Dance and the Sun Dance, although these are becoming more of a tradition than a part of religious ritual. The isolation of the tribe, however, is beginning to cease. The children are bussed to schools in Cortez, and some of them leave the reservation in pursuit of employment, education, or for other reasons. Still, a large number of children are not leaving, and the reservation population at Towaoc is steadily increasing. Some of the Indians are gradually participating in the social and cultural activities of the Caucasian population.

With the constant influx of retired people, as well as those moving in for other reasons, a gradual changing of the cultural values of the area may be seen. More emphasis is being put on such activities as concerts, plays, television, and movies. In addition, the area is characterized by a very diversified religious background which helps to emphasize the cultural variety. Nearly all of the major Christian religions are represented, as well as many non-Christian religions.

Recreation is of equal importance to the natives and newcomers alike. The development of outdoor recreational resources is one area which brings the joint support of all social groups, regardless of their cultural background.

The gradual trend away from an agrarian society and toward urbanization should continue without the project. The cultural values of the Ute Mountain Ute Indians may undergo some changes. As an annual source of income, the tribe depends heavily upon the tribal fund, which receives revenues from tribal industries and energy resource leases. The fund has gradually declined, and the tribe thus needs a stabilizing source of income which could be provided by the development of 7,500 acres of agricultural lands under project conditions. Without the project, and faced with the decreasing tribal fund, many members may be forced to leave the reservation in search of employment. This emigration would tend to accelerate acculturation into the dominant Anglo society and erode the cultural values which the Ute Mountain Utes are striving to retain.

CHAPTER C

ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

C. ENVIRONMENTAL IMPACTS OF PROPOSED ACTION

1. Air Quality and Noise Levels

The project would not have long-term impacts on ambient air quality, but it would have some short-term effects during the 9-year construction period. Emissions and dust from construction equipment, blasting operations, and handling of earth or aggregate materials, and smoke from burning cleared timber and brush or rubbish would increase particulate levels in the atmosphere and decrease air quality locally during construction. Another nuisance would be noise generated by construction equipment and blasting.

2. Geology

Very limited land slumping could occur along portions of McPhee Reservoir. Between House Creek and the planned location of the Dolores Tunnel, the Morrison Formation could be expected to be undercut and form overhangs where wave action developed along the reservoir. Small landslide slumps in the overburden on the Morrison materials are common in Beaver Creek and Dry Creek Canyons but are several hundred feet above the reservoir level and would cause no problems.^{1/}

The potential for oil and gas production should not be significantly affected by construction since all productive areas can be reached by drilling angle holes.^{2/} Sand and gravel deposits in McPhee Reservoir basin would no longer be available. Consequently, additional gravel deposits could be developed to the north and northwest of Dolores and along the river upstream from Dolores.

The Great Cut arm of McPhee Reservoir, the McPhee Complex recreation site, and the southern half of the wildlife mitigation area on the west side of McPhee Reservoir would be located on land designated by Montezuma County as a mineral resource area because of the presence of low-grade stripable coal seams. This area would thus be excluded from possible strip mining. Permits for altering the land uses as a result of project development would be required from the county which regulates the area.

3. Electrical Energy

The project would annually use an average of 17 million kilowatt-hours of electric power, with a maximum demand of 13,000 kilowatts

^{1/} Bureau of Reclamation, Feasibility Geological Report, McPhee Dam and Reservoir Site, (February 1973), p. 6.

^{2/} Bureau of Mines, Intermountain Field Operations Center, Denver, Colo., letter to Bureau of Reclamation, Durango, Colo. (July 14, 1975).

during the irrigation season (April 15 - October 15). The power would be carried by existing Federal and private transmission lines from the Colorado River Storage Project System. Any other potential users of this power would be forced to use alternative sources of electric energy.

4. Water Resources

Project diversions would deplete the average annual runoff of the Dolores River by 105,200 acre-feet, or about 21 percent of the flow discharged into the Colorado River in southeastern Utah. This depletion would be reflected in the Colorado River between the mouths of the Dolores and San Juan Rivers, a distance of about 240 river miles. In the San Juan River Basin, the annual return flows would average 25,000 acre-feet, but would be slightly offset by the evaporation of 700 acre-feet at Dawson Draw Reservoir. The resulting flow of 24,300 acre-feet would produce a net project depletion of 80,900 acre-feet in the Colorado River below the mouth of the San Juan, or about 1 percent of the flow leaving the Upper Colorado River Basin at Lees Ferry, Ariz. The depletion would consist of 70,250 acre-feet from irrigation, 4,350 acre-feet from municipal and industrial use, and 6,300 acre-feet from reservoir evaporation.

The project would provide more uniform flows in the Dolores River below McPhee Reservoir by storing and diverting part of the high spring flows and releasing water to augment the low summer and fall flows. Flows during the winter would be essentially unchanged during years of normal runoff (see Table A-14). By storing much of the high runoff of spring, McPhee Reservoir would reduce flood related damages.

The project would also affect streamflows above the town of Dolores. With irrigation storage provided in McPhee Reservoir, it is anticipated that the Montezuma Valley Irrigation Company would reduce fluctuations in Groundhog Reservoir and maintain a high water level, which would provide increased flows in Groundhog Creek during the spring. In the summer and fall, flows would normally be reduced, since releases for nonproject irrigation would be necessary only during dry years. These changes would be reflected in parts of the West Dolores and Dolores Rivers. Table C-1 summarizes the estimated effects of the project on Groundhog Creek and the Dolores River from April through October during representative dry, normal, and wet years. The effects on the West Dolores River are not shown in the table since flow records are not available for that stream.

In the San Juan River Basin, the project return flows would increase the annual runoff in local drainage channels, many of which are now dry during the summer and fall. Monument Creek, Cross Canyon, and Hovenweep Canyon drain most of the Dove Creek area and have flows only during spring runoff or storms. The project would add a total of about 8,720 acre-feet annually to these channels, primarily during the irrigation season. An additional 11,800 acre-feet would enter Yellow Jacket Canyon, McElmo Creek, and Navajo Wash as a result of return flows from all three portions of the project area. Much of the Towaoc area is drained by three

dry channels--Aztec Wash, Cowboy Wash, and Coyote Wash. The project irrigation return flows would add a total of 4,480 acre-feet to the drainages during the irrigation season. Table C-2 shows the estimated effects on the drainage systems.

Table C-1
Streamflows with and without the project
Groundhog Creek and Dolores River
(second-feet)

	Wet year (1942)		Normal year (1962)		Dry year (1959)	
	Pre- project	Post- project	Pre- project	Post- project	Pre- project	Post- project
Groundhog Creek below Groundhog Reservoir						
April	90	100		70		10
May	110	160		110		20
June	70	70		40		10
July	50	10	40	10	60	60
August	120	10	160	5	10	60
September	30	5	40	5	20	50
October	20	10		5		10
Dolores River at Dolores						
April	1,950	1,960	1,110	1,180	180	190
May	2,560	2,610	1,550	1,660	660	680
June	1,940	1,940	1,210	1,250	440	450
July	420	380	370	340	120	120
August	260	150	230	70	140	190
September	110	80	120	80	80	110
October	80	70	90	100	90	100

5. Water Quality

a. Dolores River Below McPhee Reservoir

Water quality in the Dolores River below McPhee Reservoir would be occasionally degraded during the 5-year construction period of the dam as a result of increased turbidity and sedimentation from clearing in the reservoir basin and from borrow areas. The high flows of spring and early summer, however, would clean out most of this material from the streambed. Water quality could also be adversely affected by point sources of wastewater, such as aggregate processing, concrete batching, and foundation draining, although these waters would be treated before being allowed to enter the river. Sanitary wastes would have no impacts on water quality, since they would be removed to approved sites for disposal.

The greater uniformity of flows provided by the project would generally improve the quality of water downstream. The reservoir would remove the high turbidity characteristic of spring runoff, and the increased summer flows would also improve the quality downstream. Below

Table C-2
Project return flow in
local tributaries of San Juan River

		Predicted return flow entering tributaries			
Local drainage to San Juan River	Area drained (acres)	Average existing flow (sec.-ft.)	Maximum		Quality of return flow (mg/l) ^{6/}
			Average annual acre-feet	Minimum in April (sec.-ft.)	
Monument Creek	1,640	intermittent	790	1.5	0.7
Cross Canyon	16,878	intermittent	6,520 1/750	12.8	6.2
Hovenweep Canyon	1,642	intermittent	660	1.3	.6
Yellow Jacket Canyon	12,900	2/13	3,900	7.9	3.4
McElmo Creek ^{3/}	21,100	45.9	3,850	8.4	2.6
Navajo Wash	697	3	4/3,100 450 5/500	.9	.4
Aztec Wash	590	intermittent	380	.9	.2
Cowboy Wash	1,091	intermittent	800	1.8	.5
Coyote Wash	5,126	intermittent	3,300	6.8	2.6

1/ Municipal and industrial return flow from Dove Creek area.

2/ Flow measured at Colorado-Utah State line. Includes intermittent flows from Hovenweep Canyon.

3/ McElmo Creek at Colorado-Utah State line.

4/ Municipal and industrial return flow from Cortez area.

5/ Municipal and industrial return flow from Towaoc area.

6/ Quality of irrigation return flow shown is estimated to be the highest for project operation and would occur during approximately the fourth year of operations. Quality improves gradually thereafter.

Paradox Valley, about 110 miles downstream, the improvement would be particularly noticeable. Highly saline ground water surfaces and enters the river in the valley and causes a large deterioration when riverflows are low during the summer. The project, by providing increased summer flows, would dilute the ground water and decrease the salt concentration below the valley.

b. McPhee Reservoir

During the initial filling, the reservoir could have a high turbidity, but this would soon disappear. Nutrient levels present during filling would be beneficial, aiding in the development of a productive biological community. Local algae blooms of a very limited nature are also expected. Since the reservoir would not be receiving constant nutrient loading from the Dolores River, nutrient levels would not be high enough to promote eutrophication. Considering the water exchange rate, the physical nature of the storage basin, and the use of the multilevel outlets, the possibility of stratification problems would be remote. As discussed in Chapter B, the alkalinity (pH of 8.1), hardness, and overall quality of the water would create conditions under which the heavy metals and toxic compounds present would occur in precipitated forms and consequently be biologically unavailable and pose no danger.

The removal of the Dolores wastewater treatment plant would reduce the possibility of occasional nutrient surge into the reservoir, thereby enhancing the suitability of the project water for municipal and industrial use, recreation, fish and wildlife, and aesthetics. With an improved plant constructed by the water users to meet State and Federal standards, nutrient and coliform bacteria concentrations would decrease, thus reducing any possible eutrophication and health problems that may now exist. The level of biological oxygen demand (a measure of organic pollution) would also decrease, thus improving the water quality.

c. San Juan River Basin

(1) Return Flow Quality

The average annual project return flows of 25,000 acre-feet would carry 17,210 tons of salts contained in the diverted water and an additional 10,080 tons picked up during project uses. Municipal and industrial use would account for about 1,450 tons of the annual pickup. The remaining 8,630 tons would be contributed by full service irrigation, consisting of 12,600 tons picked up in the Towaoc area minus 3,970 tons deposited in the Dove Creek area. No additional salts would be picked up by supplemental service irrigation.

In the Montezuma Valley area, the present water supply is usually in excess of irrigation requirements in the spring and early summer and inadequate in the late summer and early fall. Excessive amounts of water are consequently applied during the spring and early summer, leaching salts from the soil. Under project conditions, a more

uniform amount of water would be supplied and better irrigation methods could be used, resulting in no significant increase in the amount of salt picked up from the soils.

The salts would be picked up in the Towaoc area by the gradual leaching of the saline soils. Over a period of time, much of the salt would be removed and the soils would reach an equilibrium with the chemical quality of the irrigation water, thus gradually decreasing the salt pickup. Bureau of Reclamation studies indicate that the pickup would vary from 4.1 tons per acre in the fourth year of operation to less than 0.5 ton per acre annually after the 80th year.

In the Dove Creek area, the soil is very low in soluble salts. Salts from the irrigation water would be deposited as a result of evapotranspiration and the water and the soil gradually reaching equilibrium. Bureau studies estimate that the annual rate of deposition would begin at 0.16 ton per acre and would gradually decrease to 0.14 ton per acre. Composed primarily of lime (CaCO_3), the deposits would have no adverse effects on the agricultural value of the land.

Figure C-1 shows the predicted salt pickup from the Towaoc and Dove Creek areas over a 100-year period. The weighted average of the two areas would result in an overall project rate of about 0.8 ton per acre in the fourth year. The pickup would gradually decrease, and after about the 80th year the net effect would be a slight deposition of salt, with the return flows carrying less salt than the diverted water.

The increased use of pesticides and fertilizers on project lands would have a minimal impact on water quality. Studies have shown that pesticides used with irrigation have little impact on surface and ground waters. Some degrade rapidly and pose little or no problem. Others are strongly absorbed in clay and organic matter and can enter the surface water system on eroded sediment, but the amount of sediment eroded from irrigable land should be low, particularly on the full service lands which would be sprinkler irrigated and managed under irrigation scheduling. The Environmental Protection Agency, in studies of the Lower Colorado River from 1968 to 1973, concluded that receiving waters can be protected from pesticide pollution even in the presence of increased pesticide usage.^{1/}

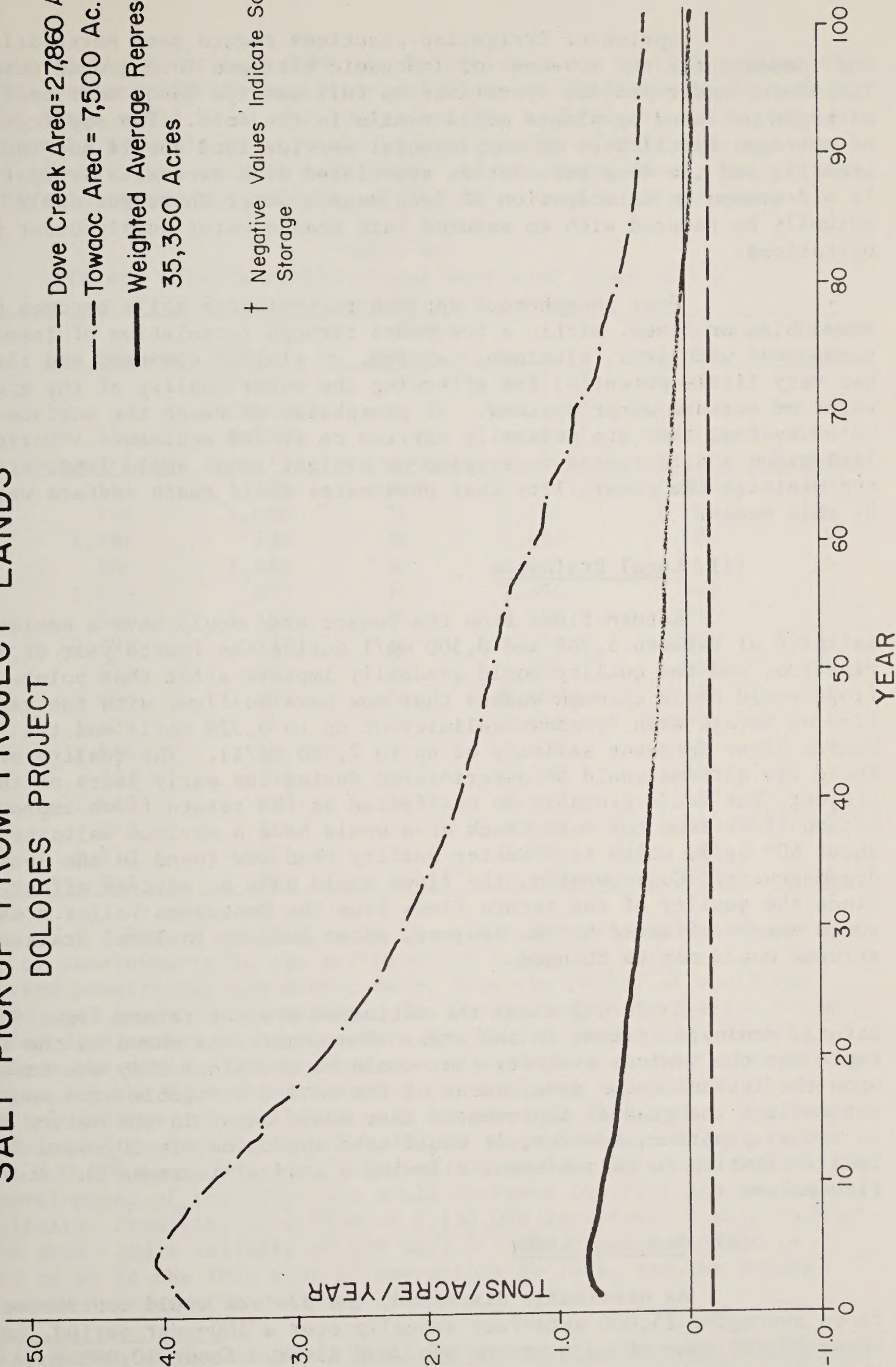
The application of nitrogen fertilizers to irrigated crop lands in the project area would result in a minimal increase of nitrates or nitrites in surface water and ground water for a variety of reasons. Leaching of nitrates appears to be small in the presence of a growing crop because of the plant's rapid intake of nitrates and free water in the soil. It has also been demonstrated that the total amount of nitrates leached from the fallowed soil is considerably greater than from a soil with growing plants. Irrigation would significantly reduce the fallow acreage in the Dove Creek area.

^{1/} U.S. Environmental Protection Agency, Report on an Investigation of Pesticides Pollution in the Lower Colorado River Basin - 1973 (December 1973).

FIGURE C-1
SALT PICKUP FROM PROJECT LANDS
DOLORES PROJECT

--- Dove Creek Area=27,860 Ac.[†]
 -.- Towaoac Area = 7,500 Ac.
 — Weighted Average Represents
 35,360 Acres

† Negative Values Indicate Salt Storage



Sprinkler irrigation practices reduce deep percolation and consequently the movement of inorganic nitrogen into ground water. Therefore, under project operations on full service lands most applied nitrogen not used by plants would remain in the soil. The application of nitrogen fertilizers on supplemental service land should not increase greatly, and the deep percolation associated with excessive irrigation in mid-season in anticipation of late season water shortages could actually be reduced with an assured late season water supply under project operations.

Most phosphorous applied to irrigated soils becomes water insoluble, or fixed, within a few hours through formulation of insoluble compounds with iron, aluminum, calcium, or similar elements and therefore has very little potential for affecting the water quality of the ground water or surface water systems. If phosphates do reach the surface water system, they are primarily carried on eroded sediments. Sprinkler irrigation and increased vegetation on project lands would limit erosion and minimize the possibility that phosphates could reach surface water by this means.

(2) Local Drainages

Return flows from the Towaoc area would have a maximum salinity of between 5,700 and 8,500 mg/l during the fourth year of irrigation, and the quality would gradually improve after that point. The flows would drain through washes that now have no flow, with the exception of Navajo Wash (present salinity of up to 6,328 mg/l) and the Mancos River (present salinity of up to 2,780 mg/l). The quality of these two streams would be deteriorated during the early years of the project, but would probably be unaffected as the return flows improved. Return flows from the Dove Creek area would have a maximum salinity of about 600 mg/l, which is a better quality than now found in the local drainageways. Consequently, the flows would have no adverse effect. Since the quality of the return flows from the Montezuma Valley area would not be affected by the project, water quality in local drainage streams would not be changed.

Table C-2 shows the estimated project return flows in the natural drainage systems in the area. The conditions shown in the table represent the maximum salinity that could occur, since they are based upon the instantaneous development of the entire irrigable area and do not reflect the gradual improvement that would occur in the return flows. In actual practice, however, it would take approximately 10 years for full irrigation to be achieved, allowing a gradual increase in return flow volume.

(3) San Juan River

As previously discussed, the project would contribute return flows averaging 25,000 acre-feet annually over a 100-year period, carrying about 27,290 tons of salt to the San Juan River. About 10,080 tons of the salt would be picked up from project uses, and 17,210 tons would

originate in the diversions from the Dolores River. Table C-3 shows the estimated project effects on historical flows of the river in September, when the flows would be at the lowest and the salinity at its highest. The return flows would be at their highest volume at this time and are assumed to carry the maximum salt load. As the table shows, the project would have increased the salinity of the river by 4 to 26 percent.

Table C-3
Project effects on historical September flows of the
San Juan River at Bluff, Utah

San Juan River at Bluff, Utah						
	San Juan River		Project return flows		Estimated effects on San Juan River	
		Total dissolved solids		Total dissolved solids	Total dissolved solids	Percent of increase
Year	Low flow (second-feet)	(mg/l)	Second-feet	(mg/l)	(mg/l)	
1959	141	1,780	36	2,690	1,960	10
1960	199	1,000	36	2,690	1,260	26
1961	1,786	738	36	2,690	780	5
1962	165	1,440	36	2,690	1,660	15
1963	1,069	877	36	2,690	940	7
1964	548	1,160	36	2,690	1,250	8
1965	2,292	532	36	2,690	560	6
1966	615	901	36	2,690	1,000	11
1967	606	1,200	36	2,690	1,280	7
1968	630	765	36	2,690	870	14
1969	1,649	561	36	2,690	610	8
1970	767	708	36	2,690	800	13
1971	1,610	938	36	2,690	980	4
1972	810	719	36	2,690	800	12
1973	3,230	617	36	2,690	640	4
1974	561	791	36	2,690	900	14

Future conditions in the river depend upon the amount and timing of developments in the northwestern corner of New Mexico. Two coal-fired powerplants now divert water from the river, as would two proposed coal gasification plants. The Navajo Indian Irrigation Project, now under development in northwestern New Mexico, would also divert water from the river. These developments would have a cumulative effect of decreasing the flow and increasing the salinity. Estimates of the cumulative impacts are available only for the year 2005, when the river is anticipated to have a flow of 1,500,000 acre-feet annually, a salt load of 830,000 tons, and a salinity of 408 mg/l at Shiprock, New Mexico. Full development of the proposals would decrease the flow and increase the salinity, resulting in a flow of 1,130,000 acre-feet, a salt load of 975,000 tons, and a salinity of 636 mg/l.^{1/} The Dolores Project is assumed to be in the 20th year of operations in 2005, and the return flows would increase the salinity by about 6 mg/l.

^{1/} Bureau of Reclamation, Final Environmental Statement: Proposed Western Gasification Company Coal Gasification Project Expansion of Navajo Mine by Utah International Inc., San Juan County, New Mexico, Int. FES 76-2 (Department of the Interior, January 14, 1976), page 3-147.

d. Colorado River

The concentrating effects of the depletions and the salt contributions from project uses would increase the salinity of the Colorado River. The total increase would amount to about 11.1 mg/l measured at Imperial Dam (about 1.3 percent above present conditions), with 10.1 mg/l from the depletion and 1.0 mg/l from the salt contribution. The effect of the depletions would be constant, but that of the salt loading would decrease from a high of 2.7 mg/l after 4 years to no apparent effect after 80 years (see Figure C-2). The estimated effects of the project are based on the conditions at Imperial Dam outlined in the Bureau of Reclamation's Quality of Water, Colorado River Basin, Progress Report No. 8 (U.S. Department of the Interior, January 1977). The report shows the modifications of stream conditions to December 1974. The conditions have been further modified to reflect the impacts of all developments constructed to 1976, developments under construction, and developments ready for construction (for which final environmental statements have been filed with the Council on Environmental Quality).

Recent studies by the Bureau of Reclamation conclude that increasing salinity causes both direct and indirect economic losses in the Lower Colorado River Basin. The damages, estimated at \$230,000 annually for each increase of 1 mg/l at Imperial Dam, have a number of causes. In agriculture, they arise from decreased crop yields, increased leaching requirements, increased management costs, and application of various adaptive practices. In the municipal and industrial sector, the detriments arise primarily from increased water treatment costs, accelerated pipe corrosion and appliance wear, increased use of soap and detergents, and decreased palatability of drinking water.

e. Summary of Impacts

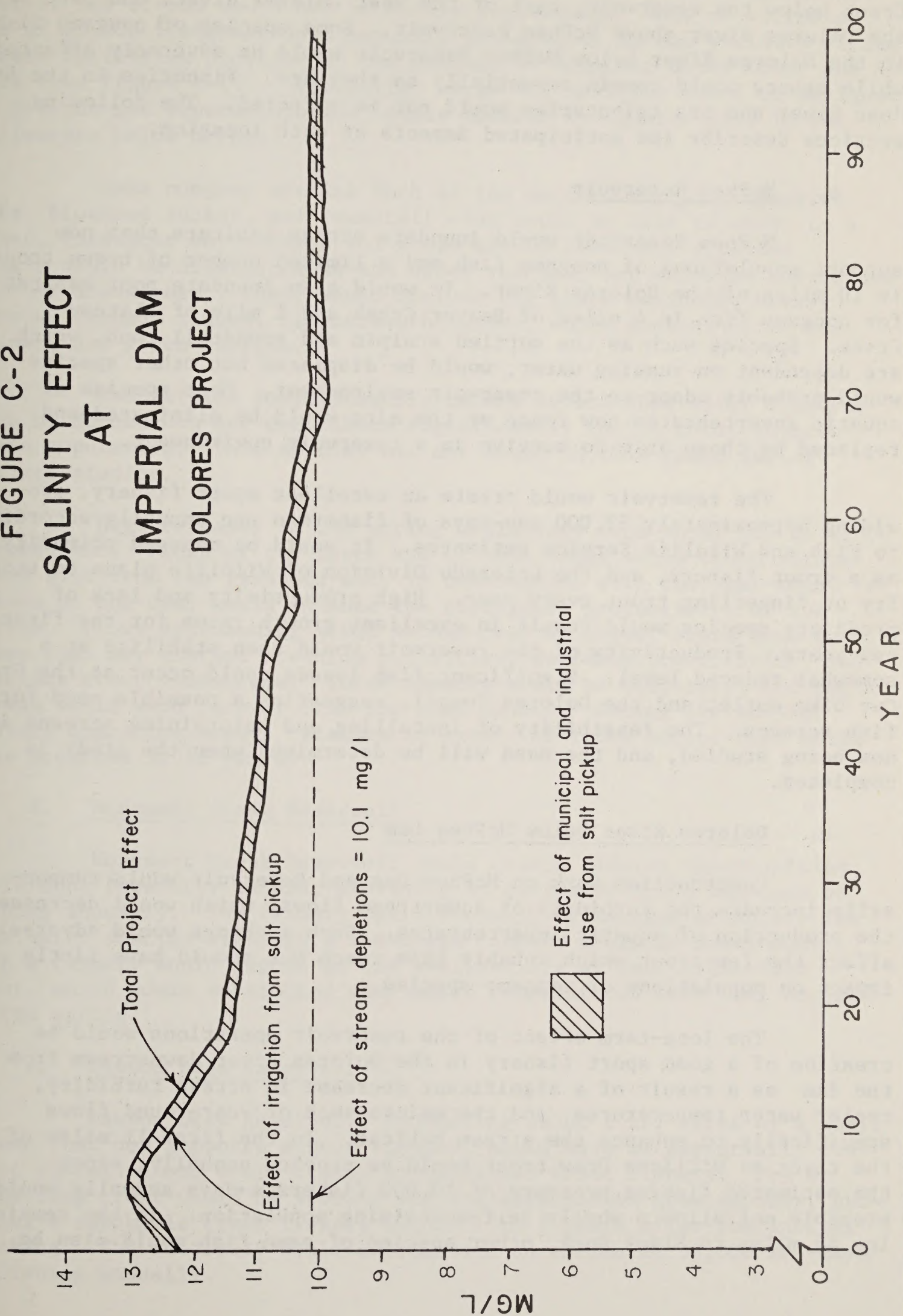
The water quality in the San Juan River and the Colorado River Basins below the project would not be significantly affected by the increased use of pesticides and fertilizers on project lands. In the initial years of project operation, however, salts would be carried into the Colorado River by project return flows and would thereby reduce the quality of the water for agricultural and municipal and industrial users in the Lower Colorado River Basin. In time, as the salts were gradually leached from the project soils in the Towaoc area, the influence of salt pickup on the water quality in the lower basin would be negligible. The project stream depletion would have a constant effect of increasing the salinity of the Lower Colorado River by 10.1 mg/l at Imperial Dam. On a 100-year average, the economic impacts due to salinity would amount to \$230,000 annually from salt pickup and \$2,323,000 annually from the stream depletion.

6. Fish and Aquatic Invertebrates

a. Introduction

By providing storage facilities, the project would create new trout fisheries in the three proposed reservoirs and the Dolores River

FIGURE C-2
SALINITY EFFECT
AT
IMPERIAL DAM
DOLORES PROJECT



below McPhee Dam. It would also enhance existing fisheries in the Montezuma Valley Irrigation Company's Groundhog Reservoir, Groundhog Creek below the reservoir, part of the West Dolores River, and part of the Dolores River above McPhee Reservoir. Some species of nongame fish in the Dolores River below McPhee Reservoir would be adversely affected, while others would remain essentially as they are. Fisheries in the San Juan River and its tributaries would not be affected. The following sections describe the anticipated impacts at each location.

b. McPhee Reservoir

McPhee Reservoir would inundate stream habitats that now support populations of nongame fish and a limited number of brown trout in 10 miles of the Dolores River. It would also inundate poor habitat for nongame fish in 4 miles of Beaver Creek and 1 mile of Plateau Creek. Species such as the mottled sculpin and roundtail chub, which are dependent on running water, would be displaced but other species would probably adapt to the reservoir environment. Most species of aquatic invertebrates now found at the site would be eliminated and replaced by those able to survive in a reservoir environment.

The reservoir would create an excellent sport fishery, providing approximately 52,000 man-days of fisherman use annually according to Fish and Wildlife Service estimates. It would be managed primarily as a trout fishery, and the Colorado Division of Wildlife plans to stock fry or fingerling trout every year. High productivity and lack of predatory species would result in excellent growth rates for the first few years. Productivity of the reservoir would then stabilize at a somewhat reduced level. Significant fish losses could occur at the Great Cut Dike outlet and the Dolores Tunnel, suggesting a possible need for fish screens. The feasibility of installing and maintaining screens is now being studied, and the need will be determined when the study is completed.

c. Dolores River Below McPhee Dam

Construction work on McPhee Dam and Reservoir would temporarily increase the turbidity of downstream flows, which would decrease the production of aquatic invertebrates. Such a change would adversely affect the few trout which inhabit this reach but should have little impact on populations of nongame species.

The long-term effect of the reservoir operations would be creation of a good sport fishery in the Dolores River downstream from the dam as a result of a significant decrease in stream turbidity, cooler water temperatures, and the maintenance of year-round flows specifically to enhance the stream habitat. In the first 11 miles of the river to Williams Draw trout would be stocked annually, since the estimated fishing pressure of 10,000 fisherman-days annually would probably not allow a wholly self-sustaining population. In the remaining 45 miles to Slick Rock, other species of game fish would also be

stocked because of increasing water temperatures. In this section of the stream the fishery would be at least partially self-supporting because most of the stream would not be easily accessible. Most of estimated use of 28,000 fisherman-days annually would occur in the vicinity of the access facilities provided by the project at Mountain Sheep Point and Slick Rock (see Figure A-15). The outlet works and spillway would be designed to prevent gas supersaturation levels harmful to aquatic life in the tailwaters below McPhee.

Some nongame species such as the mottled sculpin, speckled dace, bluehead sucker, and roundtail chub would be able to adapt to a clear, coldwater environment and would not be adversely affected. Others would be eliminated in the upper reaches, but would be maintained farther downstream. These would include the black bullhead, brassy minnow, fathead minnow, flannelmouth sucker, white sucker, carp, red shiner, and green sunfish.

Caddisflies would probably become established after construction of McPhee Dam and contribute significantly to the total invertebrate population. This species was not found in this reach during project studies.

High releases in the spring would vary from about 500 to 4,000 second-feet. Flows at the lower end of this range would flush accumulated silt from the riverbed and, in combination with the year-round releases at the dam, would enhance the biological productivity of the stream. Flows approaching 1,000 second-feet or higher would have velocities that may disrupt spawning activities, decrease productivity, and displace trout downstream. These impacts would be temporary, and the stream would soon recover from the high runoff. During the 46-year project operation study, releases in excess of 1,000 second-feet would have occurred in 16 years.

d. Monument Creek Reservoir

Monument Creek Reservoir would create fishing opportunities where none presently exists, providing an estimated 1,500 man-days of fishing annually. The fishery would probably be managed primarily for warm water species although a two-stage fishery could be developed. Such a fishery would depend on the availability of catchable-sized trout, which would be stocked when water temperatures were cool enough in the spring.

e. Dawson Draw Reservoir

Dawson Draw Reservoir, inundating about 1 1/2 miles of a small stream that now supports a poor fishery, would have an essentially constant shoreline and would create an excellent trout fishery. Fry or fingerling trout would be stocked and are expected to grow rapidly, producing a catchable trout fishery within 1 to 2 years after the initial stocking. The reservoir would accommodate an estimated 35,000 man-days of fishing annually.

f. Groundhog Reservoir

It is anticipated that the Montezuma Valley Irrigation Company would modify its operations to reduce the fluctuations at Groundhog, Narraguinnep, and Totten Reservoirs under project conditions, thereby improving the fish habitat. Stabilization would produce cooler water temperatures, less danger of summer and fall fish kills, and a general increase in the carrying capacity. The Bureau of Reclamation has not projected increased fishing use at Narraguinnep and Totten Reservoirs. It anticipates, however, that fishing use would increase by about 17,600 man-days annually at Groundhog Reservoir.

With Groundhog Reservoir operated to reduce fluctuations, downstream flows would increase in Groundhog Creek, which would in turn increase flows in parts of the West Dolores and Dolores Rivers. Increased fishing opportunities are estimated at 2,400 man-days in Groundhog Creek, 4,000 man-days in the West Dolores River, and 1,600 man-days in the Dolores River.

g. San Juan River

All return flows from irrigated land would drain into the San Juan River, as pointed out earlier, increasing the flow and salt concentrations. Since the overall effect would be to decrease water quality by only 6 mg/l, no significant impact on aquatic organisms is expected.

7. Terrestrial Wildlife

a. General

Project construction and operation would affect wildlife and wildlife habitat. Although certain impacts would be directly attributable to the project, others would indirectly result from the use of project water and facilities. Table C-4 lists the long-term changes in habitat that would occur at each of the proposed features. Additional habitat would be temporarily disturbed during construction but would recover.

Construction activities would disturb wildlife during the 9 years required to construct the project, largely because of noise, dust, blasting, the activity of men and equipment, and the temporary removal of vegetation in work areas. In addition to removing cover and food, the work would affect big game animals on their range during the winter and interrupt the breeding and rearing periods of other species during the spring and summer. Although some species could avoid the construction areas, they would be displaced onto adjacent land which in some instances is already at carrying capacity, thus resulting in a loss of some animals as well as a deterioration of the habitat. Other species which are less mobile, such as reptiles, amphibians, and other small animals, would suffer losses at the construction sites.

Table C-4
Long-term terrestrial habitat changes of the Dolores Project

Feature and present habitat	Acres required	Acres affected	Habitat with project
McPhee Reservoir			
Reservoir basin			
Native pasture	816	816	Open water and foreshore
Dry crop land	197	197	Open water and foreshore
Irrigated crop land	989	989	Open water and foreshore
Riparian	448	448	Open water and foreshore
Pinon-juniper	1,619	1,619	Open water and foreshore
Gravel pit	86	86	Open water and foreshore
Waste land	75	75	Open water and foreshore
River	240	240	Open water and foreshore
Subtotal	4,470	4,470	
Roads			
Dry crop land	8	8	Roads (no habitat)
Pinon-juniper	38	38	Roads (no habitat)
Recreation area			
Pinon-juniper	290	290	Landscaped recreation area
Waste land	20	20	Landscaped recreation area
Wildlife management areas			
Native pasture	230	230	Improved wildlife habitat
Dry crop land	402	402	Improved wildlife habitat
Pinon-juniper	4,138	4,138	Improved wildlife habitat
Great Cut Pumping Plant			
Pinon-juniper	2	2	No habitat
Reservoir right-of-way			
Native pasture	614		No change
Dry crop land	205	203	Successional habitat changes
Irrigated crop land	1,031	1,029	Successional habitat changes
Riparian	529		No change
Pinon-juniper	3,084		No change
Gravel pit	84	82	Successional habitat changes
Waste land	97		Waste land
River	32		River
Total	15,274	10,912	
Dolores River			
Recreation areas (riparian)	78		No change
Streamside easements (riparian)	57		No change
Total	135		
Dolores Tunnel			
Pinon-juniper	7	3	No habitat
Dolores and Towaoc Canals			
Intermountain wood land	44	37	151 acres of canal and road; re-
Irrigated crop land	150	128	maining 480 acres reseeded for
Pinon-juniper	250	212	upland game and nongame habi-
Grass land	306	260	tat
Total	750	637	

Table C-4 (Continued)
Long-term terrestrial habitat changes of the Dolores Project

Feature and present habitat	Acres required	Acres affected	Habitat with project
Dove Creek Canal			
Intermountain wood land	41	35	137 acres of canal and road; 273 acres reseeded for upland game and nongame habitat
Irrigated crop land	71	60	
Pinon-juniper	101	85	
Dry crop land with scattered pinon-juniper	270	230	
Total	483	410	
South Canal			
Dry crop land with scattered pinon-juniper	95	75	26 acres of canal and road; 49 acres reseeded for upland game and nongame habitat
Cortez-Towaoc Pipeline			
Irrigated crop land	10		No change
Pinon-juniper	6	6	No habitat
Dry crop land	7		No change
Waste land (existing highway right-of-way)	48		No change
Total	71	6	
Monument Creek Reservoir			
Reservoir basin			
Native pasture	6	6	Open water and foreshore
Seeped pasture	32	32	Open water and foreshore
Dry crop land	46	46	Open water and foreshore
Recreation areas			
Seeped pasture	7	7	Landscaped area with shade trees
Dry crop land	3	3	Landscaped area with shade trees
Fish and wildlife areas			
Seeped pasture	21	21	Upland game food plots
Dry crop land	54	54	Upland game food plots
Reservoir right-of-way			
Native pasture	36		No change
Seeped pasture	12		No change
Dry crop land	155		No change
Total	372	169	
Dawson Draw Reservoir			
Reservoir basin			
Irrigated crop land	2	2	Open water and foreshore
Wet lands	73	73	Open water and foreshore
Native pasture	219	219	Open water and foreshore
Recreation facilities			
Native pasture	2	2	Parking lots
Reservoir right-of-way			
Irrigated crop land	116	116	Successional habitat changes
Pinon-juniper	10		Unchanged
Native pasture	461		Unchanged
Wet lands	189		
Total	1,072	412	
Dove Creek area full service land			
Dry crop land	27,860	27,860	Irrigated crop land
Towaoc area full service land			
Semidesert grass land	7,500	7,500	Irrigated crop land

Long-term impacts would vary according to species. Big game populations would be essentially unchanged. The project would provide an overall increase in habitat for waterfowl and shorebirds, gamebirds, and most furbearers, but would noticeably decrease the available habitat for such species as prairie dogs, bobcats, and reptiles. Small losses would also occur in habitat for raptors, small game mammals, and nongame mammals.

b. Big Game Mammals

(1) Mule Deer

Project development would cause some short-term losses of deer but would not have significant adverse effects after the wildlife management areas at McPhee Reservoir were fully developed. McPhee Reservoir would remove about 4,500 acres of winter range which is in poor to fair condition and now supports about 450 deer. Associated developments for recreation and access would remove an additional 360 acres. Animals now using the area would be displaced to surrounding winter range which, in its present condition, cannot be expected to support the increased capacity. In the long term, however, the development of the wildlife management areas would increase its carrying capacity enough to compensate for the lost habitat and to maintain the overall deer population of the project area at about its present level. The reservoir would also cause losses from deer attempting to swim the reservoir or cross on thin ice. Such losses cannot be estimated but should be considered significant since the reservoir would create a 10-mile-long barrier to traditional migration routes across the Dolores River.

The paved access road to McPhee Dam and the Dolores River would be conducive to high speed travel, and deer could be lost in collisions with vehicles, particularly where the highway borders the wildlife management areas. By serving as a focal point for winter sportsmen, the recreational sites and nearby areas would be less desirable for deer winter range than at present but the use of the areas is not expected to result in a decline of deer populations.

Monument Creek Reservoir would have little effect on deer since the grasses and dry crops now at the site do not provide important winter range. The 75-acre wildlife area, although managed specifically for upland game, may be used by migrating deer. Dawson Draw Reservoir would also have little effect on winter range, although human activity at the site may affect a migration route and force the deer to detour. Food plots planted for upland game and waterfowl may be used by deer.

The project canals should not have significant effects on deer. The Dove Creek Canal, which would have the greatest length, width, depth, and velocity of flow, would cross several migration routes and would consequently have the greatest impact on deer movement. With the exception of fawns, the animals should have little trouble crossing

the canal once they became familiar with it. Only fawns from the relatively small resident herd should be affected, however, since most fawning occurs at higher elevations to the northeast of the project area. The Dolores and Towaoc Canals would traverse areas with smaller deer populations and would not be expected to be barriers to migrating animals.

Two factors would tend to decrease the impacts of the project canals on deer. First, they would carry irrigation water only from April through October, when most deer are on their summer ranges at higher elevations. Second, the canals would generally be earthlined, allowing deer to climb the banks. Only about 15 of the approximately 94 miles of canal would have concrete lining. The largest concrete-lined section, 10 miles at a capacity of 135 second-feet, would be located on the Towaoc Canal at McElmo Creek and would have an 8-foot deer fence on both sides. A very short reach (62 feet) on the Dolores Canal, with a capacity of 70 second-feet, would be too small to present a barrier. The last 4 miles of the Dove Creek Canal and 1 mile of the South Canal, although concrete-lined, would have capacities of less than 50 second-feet and would also be too small to create problems for migrating deer.

The conversion to irrigated farming in the Dove Creek area would cause an increase in production of alfalfa, which is more susceptible to damage by deer than are the dry-farmed crops. The animals are attracted by forage, haystacks, and other cultivated feeds during the winter and early spring, when natural food is limited. Initial and possibly significant crop damage may occur as a result of the decrease in winter range, but this damage would decrease as management efforts increased the carrying capacity of the wildlife management area. Irrigation in the Towaoc area may attract a few deer from Ute Mountain and the Mancos Canyon, but the extent should be insignificant since the cover and forage of the surrounding area is very poor and deer use is consequently small.

Overall, the project is expected to have insignificant adverse effects on the overall deer population after the wildlife areas were developed to their expected carrying capacity. Most of the long-term effects would result from increased disturbance by human activity, collisions with automobiles at McPhee Reservoir, and losses of deer attempting to cross the reservoir on thin ice. In other parts of the area, the long-term impacts would also be insignificant.

(2) Elk

McPhee Reservoir is not expected to have a long-term impact on the size of the elk population. Although inundation would remove winter range that now supports about 300 elk, the wildlife management areas would provide enough carrying capacity to offset the loss. Some animals would probably be lost, however, before the development of

the wildlife areas was completed. The reservoir would also inundate two elk migration routes on the Dolores River.

Similar situations at Blue Mesa and Taylor Park Reservoirs in Colorado indicate that elk are not likely to establish new routes around McPhee Reservoir.^{1/} The elk swim for distances of up to 2 miles and have little difficulty when no ice is present. Thin ice and edge ice cause problems, since the animals can enter the water and swim across but are blocked from getting out by the ice. When trapped in this manner, they usually die from exposure. Based on this information, it is expected that long-term losses may occur.

The construction of roads and recreation sites would have essentially the same effects on elk winter habitat as they would on deer because of the overlap in their winter ranges. The disturbances probably would be greater for elk since these animals are generally less tolerant of human intervention. The conversion of dry land to irrigated crops is expected to attract elk, and crop damage could occur before the wildlife management areas were developed. Other project features are not expected to have a measurable effect on elk since they would not be located on elk winter range or migration routes.

c. Mountain Lion and Black Bear

Specific effects on the mountain lion are not readily predictable because of the animal's extensive range and dependence on a large variety of prey. Some lions could be displaced, but the project is not expected to reduce significantly the amount of prey or the mountain lion population. A hunting route located south of Dolores would be altered by the presence of McPhee Reservoir, and the large increase in human activity would also reduce the lion's present range.

The project could adversely affect the black bear. McPhee Reservoir would inundate some habitat, and increased human activity could force bears to relocate on adjacent lands. Recreation areas could attract some bears to the area because of the possibility of a new food source, perhaps leading to their removal by trapping and relocating. The net effect would be an insignificant decrease in the population of bears in the area.

d. Small Game Mammals

The only small game mammal noticeably affected would be the desert cottontail, whose habitat would be increased by the project. Although McPhee Reservoir would remove habitat supporting about 100 cottontails and Monument Creek and Dawson Draw Reservoirs would displace a very small number of animals, the wildlife areas of the latter two reservoirs

^{1/} Personal communication from Clifford Coghill, Wildlife Conservation Officer, Colorado Division of Wildlife, Gunnison, Colo.

would provide enough food and cover to result in an overall increase in the population. Canals, pumps, roads, and other project features would destroy some game habitat, but planned seeding for food and cover would compensate for the losses. The conversion of dryland farms to irrigation would benefit cottontails by the establishment of permanent cover, and irrigation return flows would increase forage and cover production along waterways. No significant effect is expected on the snowshoe hare, chickaree squirrel, or Abert's squirrel since their respective habitats within the project area are small.

e. Furbearers

The project would significantly increase the amount of habitat available for the beaver and muskrat in the area. Releases from McPhee Reservoir would provide excellent habitat in the Dolores River although the reservoir itself would probably be used only lightly because the fluctuating water level would not provide good habitat. Dawson Draw Reservoir would provide suitable habitat for the muskrat since the stable water level would result in abundant riparian and aquatic vegetation, but it would also inundate grasses and marsh that already support a good population.

McPhee Reservoir would decrease populations of skunks and weasels by destroying their food sources and cover. The omnivorous food habits of the skunk would enable it to adapt to a changing environment, however, and suitable habitat would be created around recreation areas where new food sources would be created. Permanent streamflows below McPhee Dam would increase riparian vegetation and may attract mink to the area. Because of limited habitat and small populations within the McPhee area, no other furbearers would be significantly affected by inundation.

Dawson Draw Reservoir would inundate an area that now attracts substantial populations of skunks, but the enhanced vegetation expected around the reservoir could support displaced populations. Food patches planted in conjunction with the wildlife area would increase populations of rodents, thereby providing additional food sources for weasels and gray foxes.

Monument Creek Reservoir would inundate cropland which supports few furbearers, and impacts are consequently expected to be negligible. A greatly fluctuating shoreline would prevent the growth of aquatic vegetation and offer little habitat for aquatic furbearers.

Habitat would be lost in the change from dryland to irrigated farms, and the effects on furbearers using these areas would depend upon the amount of permanent cover left undisturbed. Return flows in adjacent drainages would increase available cover. The project canals, pumping plants, and roads would also decrease furbearer habitat, although planned reseeding of areas adjacent to these features should more than compensate for the habitat lost. The side slope ratios of 1.5:1 on concrete-lined sections of canals should allow most furbearers to escape, with the exception of very young animals.

f. Varmints

McPhee Reservoir would inundate a colony of prairie dogs near Great Cut Dike and substantial habitat for the blacktail jackrabbit, porcupine, and rock squirrel. The loss of these species would thereby reduce the hunting range of the coyote, bobcat, and raccoon. Although the bobcat would decrease in population because of this loss, the coyote is more able to adapt to a changing environment and would probably be affected only slightly. Increased riparian growth and permanent stream-flows below McPhee Dam should provide adequate habitat for displaced raccoons, which may also use the edge of the reservoir as a feeding area.

At Dawson Draw and Monument Creek Reservoirs the change to a reservoir environment, the establishment of permanent vegetation, and the planting of wildlife food patches should have a beneficial effect for most varmints. Inundation would not have significant adverse effects, since the existing habitat in these areas supports few varmints.

The increase in irrigated crops would probably increase populations of jackrabbits, thereby providing additional prey for the coyote and bobcat. Any permanent cover established as a result of irrigation would also significantly enhance the hunting ranges of these larger varmints by increasing available cover and food sources for significantly larger populations of small rodents. The irrigation on the Ute Mountain Ute Indian Reservation would remove 7,500 acres of the prairie dog habitat. Although farming practices would provide an excellent food source for prairie dogs, their burrowing habits would lead to extensive control measures on croplands and on about 2,500 acres of adjacent land. Such measures would be coordinated by the U.S. Fish and Wildlife Service to avoid destruction of other species.

g. Nongame Mammals

Nearly all project facilities would remove habitat that supports nongame mammals, but this loss would be partially offset by the growth of permanent vegetation around the reservoirs and adjacent to irrigated land. This vegetation, combined with the reseeding operations along canal rights-of-way and the food plots at the wildlife management areas, would result in a net increase in habitat and in populations of nongame mammals.

h. Game birds

The project would have an overall beneficial effect on game bird habitat, primarily because of seeding along canal rights-of-way and the development of food and cover plots at Dawson Draw and Monument Creek Reservoirs. These provisions would more than offset losses of habitat through construction.

McPhee Reservoir would remove habitat used by the turkey, ring-necked pheasant, sage grouse, mourning dove, and band-tailed pigeon.

Inundation would displace most of these species to suitable habitat on adjacent lands with exception of the sage grouse. This species is almost entirely dependent on a sagebrush community and, since little of this habitat exists nearby, would undergo a significant population decrease. The effects on the turkey and pheasant would not be significant, since their habitats within the reservoir basin are limited and larger inhabitable areas occur outside the site.

Additional habitat created by irrigation on lands previously dry farmed would benefit both upland and migratory game birds. The irrigation of previously arid land on the reservation would also provide additional cover and food, particularly for doves, where very limited amounts have existed in the past.

The impacts of the project on the blue grouse and sharp-tailed grouse are expected to be minor because their habitats are primarily outside the project area at higher elevations. Project effects on chukar are also expected to be minimal since little of their habitat is located at the sites of project features. Populations of Gambel's quail, which are considered almost nonexistent in the project area, may be enhanced by irrigation development on the reservation. This area is within the northern range of the species, but the lack of food, water, and cover limits its abundance.

i. Waterfowl and Shorebirds

Significant increases in habitat at McPhee, Monument Creek, and Dawson Draw Reservoirs would increase use by waterfowl and shorebirds for resting and feeding. The year-round, more uniform flows provided in the Dolores River below McPhee Dam would improve nesting habitat and could create desirable wintering areas. Because of fluctuating water levels, McPhee and Monument Creek Reservoirs would not provide nesting habitat. Dawson Draw Reservoir, however, with its stable shoreline would provide suitable nesting habitat for waterfowl, and a resident population is likely to develop. An increase in waterfowl hunting of approximately 3,200 man-days annually is expected. It is anticipated that the existing Groundhog, Totten, and Narraguinne Reservoirs would also increase surface area available for waterfowl and shorebird use. Project canals would benefit resident and migrant spring waterfowl by providing resting areas during the irrigation season. Irrigation would create valuable feeding sites for both waterfowl and shorebirds. The increased populations would cause more depredation on grain crops on both newly irrigated land and land now irrigated, particularly during late summer and early fall, when waterfowl begin migration.

j. Raptors

McPhee Reservoir would eliminate hunting and loafing areas in the river bottom presently used by the northern bald eagle, red-tailed hawk, great-horned owl, cooper's hawk, goshawk, kestrel, and golden eagle. This habitat loss would be partially offset by the presence of the reservoir, which would provide a food source in the form of fish,

shorebirds, and waterfowl. Reservoirs are known to provide valuable habitat for bald eagles, and a significant wintering populations would be attracted by McPhee Reservoir during late fall and early winter. After the reservoir froze over, eagles would probably use the river below McPhee Dam. If a resident waterfowl population were established, peregrine falcons could possibly be attracted to the area. The enhancement of riparian vegetation below McPhee Dam would also provide additional feeding areas for many species of raptores.

Dawson Draw Reservoir would eliminate several hundred acres of hunting habitat used by raptores, but the adverse effect would be partially offset by the establishment of a waterfowl management area which would attract several species of raptores, especially the bald eagle, golden eagle, and peregrine falcon. Monument Creek Reservoir would have little effect on raptores, because its small size and fluctuating water level would provide little habitat.

Other project features should have very little effect, with some exceptions. The elimination of pinon-juniper woodland in association with roads and canals would reduce nesting areas for the sharp-shinned hawk, Cooper's hawk, and great horned owl. Irrigation of presently dry-farmed land would produce additional cover and increase the populations of rodents available as prey. The reduction in prairie dog populations on the reservation would remove a food source for many raptores, but the increase in available food, water and cover caused by irrigation would increase carrying capacities for small rodents as prey. Increases in waterfowl and shorebirds at the existing reservoirs would provide additional prey for some raptores, although increased recreation would have an adverse effect on the use.

k. Nongame Birds

Because of the large number and diversity of species, effects that would be beneficial for one group may be detrimental for another. In discussing the impacts on nongame birds, attention is therefore given to the majority, rather than to each species. Riparian woodland is probably occupied by a greater abundance and diversity of birds than any other vegetation type, and the inundation of this habitat by McPhee Reservoir would therefore displace a large number of nongame birds. Most of these species are migratory, and the greatest effect would be on breeding populations (i.e., summer residents), which would be forced to seek similar habitat elsewhere. The development of riparian vegetation below McPhee Dam would provide good habitat, although it could not replace the lost habitat at the reservoir site. Overall, an insignificant loss of nongame birds would occur.

The loss of existing marsh land with the construction of Dawson Draw Reservoir would have an adverse effect on a relatively small number of birds. The establishment of a wildlife management area, however, would attract a greater number and diversity of birds than are now found at the site.

Monument Creek Reservoir would enhance bird populations by providing water, which is a limiting factor in this relatively arid habitat. Growth of riparian vegetation, although limited because of a fluctuating shoreline, would also increase the populations.

The construction of canals, roads, pumping plants, and other project features would destroy habitat used by nongame birds, but revegetation plans and the addition of a water source would largely compensate for this loss. The change from dry farms and from arid grasses to irrigated farms would provide additional food, water, and cover.

1. Reptiles and Amphibians

Inundation by McPhee Reservoir would eliminate reptiles and amphibians using valley and woodland habitats in this area. Because of the fluctuating water level, the reservoir shore would not provide suitable habitat for most species associated with stable ponds. Dawson Draw Reservoir would also inundate habitat occupied by reptiles and amphibians but would provide much habitat around its edge for the wandering garter snake and for amphibians which presently occur at the site. Monument Creek Reservoir would eliminate habitat occupied by the desert short-horned lizard and Great Basin sagebrush lizard. It would provide an excellent breeding site for Utah tiger salamanders, red-spotted toads, Rocky Mountain toads, boreal chorus frogs, and western leopard frogs.

Other project features are expected to have little effect on reptiles or amphibians because of low population densities in these areas. An exception would be the Dove Creek Canal, which would reduce or eliminate small islands of natural vegetation. Species affected would be the Great Basin sagebrush lizard, northern plateau lizard, northern tree lizard, and wandering garter snake.

The project would have a detrimental effect on reptiles on the reservation. Many of the species inhabiting this area require prairie dog burrows for use as dens, and these burrows would be eliminated with cultivation, irrigation, and rodent control. This modification would completely change the species composition and reduce the diversity of reptiles. The northern side-blotched lizard and desert striped whipsnake would be the only reptiles able to adapt. The importation of water to this arid grassland, however, could favor Utah tiger salamanders, red-spotted toads, Rocky Mountain toads, western leopard frogs, and wandering garter snakes.

8. Threatened or Endangered Species

Studies have revealed the presence of only one endangered species, the peregrine falcon, within the project area. Although the effect of the project is considered to be minimal, the importance of this species requires that all of the foreseeable impacts be discussed.

The existence of a peregrine aerie has been tentatively confirmed on the Ute Mountain Ute Reservation, southwest of Cortez. Under the present policy of the Ute Mountain Ute Indian Tribe, access to the reservation is restricted to tribal members, with few exceptions. This policy would prevent essentially all disturbances from bird watchers and other individuals, even if access to the area becomes less difficult.

Construction activities near the suspected peregrine aerie during courtship, incubation, and rearing of young could cause the falcons to abandon the site. Researchers tend to disagree on the amount of human activity that can be tolerated by peregrines. Some feel that human activity produces no harmful effects, while others believe it to be a major cause of nest abandonment.^{1/} The amount of disturbance required to cause this abandonment cannot be predicted and probably differs with each pair of nesting birds. To minimize the possibility of abandonment, construction activities within the vicinity of the aerie would be avoided between February 1 and August 1 if peregrines were present.^{2/} The net long-term effect of project irrigated land and reservoirs would probably be beneficial to peregrines by increasing the number of prey species available in the form of nongame birds, waterfowl, and shorebirds.

Historical sightings of peregrine falcons in the Dolores River Canyon between the Williams Draw and Slick Rock indicate the possibility of future use of the area by this species. Increased recreation along the river would tend to decrease the suitability of this area as hunting habitat, although the sustained riverflows would probably increase the availability of prey species.

Although no black-footed ferrets were found in the project area, the Ute Mountain Ute Indian Reservation contains a considerable amount of potential habitat. An estimated 50,000 acres of active prairie dog habitat surrounding the project lands and within the boundaries of the reservation would provide a buffer to any ferrets displaced by the project.

9. Vectors and Related Problems

The project would not have a significant effect on mosquitoes. Steep slopes at McPhee and Monument Creek Reservoirs would not be conducive to ponding during drawdown, and drainage channels would minimize ponding on gentle slopes. McPhee Reservoir would inundate 10 miles of the Dolores River, where pools remaining from spring floods now provide good habitat. Dawson Draw Reservoir would create standing water, but it would also inundate a marshy area that is already a habitat for mosquitoes. Irrigation should also have a minimal effect, since lined canals, sprinklers,

^{1/} Bureau of Land Management, Habitat Management Series of Endangered Species, No. 1 (1972).

^{2/} Rocky Mountain/Southwestern Peregrine Falcon Recovery Team, American Peregrine Falcon Recovery Plan, (1976) p. 26.

buried pipe laterals, irrigation scheduling, and drainage facilities would result in minimal standing water. The project recreation facilities would expose larger numbers of people to both mosquitoes and ticks, and control measures could be possible for public health. If vector controls were to become necessary, they would be the responsibility of the various administering agencies.

10. Historical and Archaeological Sites

Project construction and the recommended studies of sites in the area would adversely affect properties that may be nominated to the National Register of Historic Places but would not affect any properties already listed on the National Register, as reported in the Federal Register of February 10, 1976, and monthly supplements. McPhee Reservoir would inundate the townsites of McPhee and Big Bend and about 5 miles of the 1,800-mile route taken by the Dominguez-Escalante expedition in 1776. Of the 487 archaeological sites identified in the general area of project influence, a total of 215 would probably be affected: 59 by the recommended investigation and recovery program alone, 78 by construction and inundation alone, and 78 by both of these activities. Based on the survey of the area by the University of Colorado, 192 of the affected sites are considered to be significant and 23 insignificant. Another effect could occur from raised ground water levels resulting from the proposed reservoirs, but the nature of the impacts is little known. An additional 303 known sites would be indirectly affected through increased public access and use of the area, particularly by treasure hunters and vandals. Table C-5 summarizes the number of sites impacted by cultural periods and features.

11. Land Ownership and Use

The rights-of-way for project features, as shown in Table A-15, would total about 18,259 acres. About 11,752 acres of private non-Indian land and 285 acres of land on the Ute Mountain Ute Indian Reservation would be acquired and used for such project purposes as water storage and conveyance, public recreation, and wildlife habitat. An additional 6,222 acres of land already in public ownership would be used for the same purposes. The project would convert 27,860 acres of dry-farmed land and 7,500 acres of uncultivated land to irrigated farming.

12. Scenery

During project construction heavy machinery, increased human activity and scars would temporarily detract from scenery, although they would normally be visible only in local areas. The reservoir basins and dams would be particularly unattractive during clearing and other work before filling occurred. Excavations for canals, pipelines, and other facilities would also create sections of cleared land until vegetation could be reestablished.

Table C-5
Archaeological sites affected by project features

Locations	Cultural periods and number of sites ^{1/}	Predicted con- struction impacts (number of sites)		Recommended mitigation (number of sites)		
		No effect or possible indi- rect effect	Possible direct effect	None	Flag and	
					avoid and/or reroute	Test and/or excavate
McPhee Reservoir						
Within maximum water surface	BM II (2)		2			2
	BM II (4)		4	3		1
	BM III, P I (12)		12	7		5
	BM III, P II (3)		3			3
	P I (12)		12	1		11
	P II (2)		2	1		1
	P I, P II (9)		9	4		5
	P II, P III (1)		1	1		
	Undetermined (12)		12	6		6
Within right-of-way	BM II (1)	1				1
	BM III, P I (20)	18	2	13		7
	BM III, P II (1)	1				1
	P I (7)	4	3	2		5
	P II (11)	8	3	2		9
	P I, P II (37)	35	2	6	28	3
	P II, P III (1)	1		1		
	Undetermined (18)	12	6	11		7
On or near edge of right-of-way	P II (1)		1			1
	P I, P II (1)		1			1
Subtotal		80	75	58	28	69
Dolores River Canyon below McPhee Dam ^{2/}						
Within right-of-way	BM II, P I (6)	5	1	2		4
	P I (5)	4	1	2		3
	P II (1)	1		1		
	P I, P II (5)	3	2	2		3
	Undetermined (10)	7	3	7		3
On or near edge of right-of-way	BM III, P I (1)	1		1		
	P I (1)	1				1
	P I, P II (1)	1				1
	Undetermined (3)	3		2		1
Outside right-of-way	BM III, P I (2)	2		1		1
	P I (2)	2		1		1
	P II (1)	1		1		
	Undetermined (2)	2		2		
Subtotal		33	7	22		18

^{1/} BM = Basketmaker, P = Pueblo.

^{2/} To Williams Draw (about 10 miles below the dam).

Table C-5 (Continued)
Archaeological sites affected by project features

Locations	Cultural periods and number of sites ^{1/}	Predicted construction impacts (number of sites)		Recommended mitigation (number of sites)		
		No effect or possible indi- rect effect	Possible direct effect	None	Flag and avoid and/or rerouted	Test and/or excavate
Great Cut Dike, Dove Creek, and South Ca- nals (including pump- ing plants)						
Within right-of-way	BM III, P I (1)		1			1
	P I, P III (1)		1			1
	Undetermined (1)		1			1
On or near edge of right-of-way	BM III, P I (20)	20		6	7	7
	BM III, P II (2)	2		1		1
	P I (3)	3			3	
	P II (2)	2		1	1	
	P I, P II (2)	2		1	1	
	Historical (1)	1			1	
	Undetermined (7)	7		3		4
Outside right-of-way	BM III (1)	1		1		
	BM III, P I (19)	19		19		
	BM III, P II (4)	4		4		
	BM III, P III (1)	1		1		
	P I (4)	4		4		
	P II (4)	4		4		
	P III (1)	1		1		
	P I, P II (3)	3		3		
	P II, P III (2)	2		2		
	Historical (2)	2		2		
	Undetermined (6)	6		6		
Subtotal		84	3	58	13	16
Dove Creek area laterals						
Within right-of-way	BM III, P I (1)		1		1	
	P I (1)		1		1	
	P II (2)		2		1	1
	P I, P II (3)		3	2	1	
	P I, P III (1)		1			1
	P II, P III (3)		3		3	
On or near edge of right-of-way	BM III, P I (3)	1	2		3	
	P I (2)	1	1		2	
	P II (9)	5	4	3	6	
	P III (2)	1	1		2	
	P II, P III (5)	3	2	2	3	
	Historical (1)	1		1		
	Undetermined (5)	3	2		3	2
Outside right-of-way	BM III (1)	1		1		
	BM III, P I (17)	17		3	12	2
	P I (19)	19		4	11	4
	P II (24)	24		6	18	
	P III (2)	2			1	1
	P I, P II (2)	2			2	
	P II, P III (11)	11		2	5	4
	Undetermined (14)	14		7	6	1
Subtotal		105	23	31	80	17

1/ BM = Basketmaker, P = Pueblo.

2/ To Williams Draw (about 10 miles below the dam).

Table C-5 (continued)
Archaeological sites affected by project features

Locations	Cultural periods and number of sites ^{1/}	Predicted con- struction impacts (number of sites)		Recommended mitigation (number of sites)			
		No effect or possible indi- rect effect	Possible direct effect	None	Flag and avoid and/or rerouted		Test and/or excavate
Towaoc Canal and Laterals							
Within right-of-way	P I (1)		1			1	
	P II (6)		6			6	
	P I, P II (1)		1			1	
	P II, P III (2)		2			2	
	Undetermined (2)		2			2	
On or near edge of right-of-way	BM III, P I (2)		2		2		
	P I (1)		1		1		
	P II (15)		15		15		
	P III (2)		2		2		
	P I, P II (2)		2		2		
	P I, P III (2)		2		2		
	P II, P III (6)	1	5		6		
	Historical	1			1		
	Undetermined (9)	2	7		9		
	Outside right-of-way	BM III, P I (1)	1			1	
P I (2)		2		1	1		
P II (9)		9		2	5	2	
P III (1)		1		1			
P I, P II (1)		1				1	
P II, P III (5)		5		1	2	2	
Historical (1)		1			1		
Undetermined (5)		5		4	1		
Subtotal			29	48	9	51	17
Total		331	156	178	172	137	

^{1/} BM = Basketmaker, P = Pueblo.

^{2/} To Williams Draw (about 10 miles below the dam).

The project canals, pumping plants with elevated storage tanks up to 175 feet high, powerlines, and other facilities would alter the landscape over a long period, but in many instances they would be situated in areas already affected by man's presence. The three reservoirs would have varying impacts. McPhee and Monument Creek Reservoirs would be marked by seasonal drawdowns and would expose about 2,300 and 60 acres of foreshores, respectively, during maximum drawdown in the late summer and fall. They could enhance the landscape, however, when full in the early summer and when snow covered the foreshore in the winter. Dawson Draw Reservoir, with a nearly constant water level and a surrounding wildlife area, would provide a pleasant landscape.

The aesthetic improvement of the Dolores River resulting from the continuous streamflows would contribute to the river's appeal as a wild and scenic river, if the river were designated as such. As pointed out in Chapter A, the Departments of Interior and Agriculture and the State of Colorado have recommended that the Dolores River below McPhee Reservoir be included in the Wild and Scenic River System, based on the assumption that the Dolores Project would be built.

13. Economic and Social Conditions

a. Population

Short-term population growth in Montezuma and Dolores Counties could reach 4.5 percent annually during project construction, but following construction the rate would decrease to about 1 percent by the year 2030. Thus, with project development, long-term growth is expected to have an average annual rate of about 1.6 percent, which would be higher than the historical rate of 1.3 percent and the predicted rate of 1.5 percent if the project were not built. Short-term growth would be associated primarily with the influx of construction workers and their families. Long-term growth would result indirectly from the increased economic growth produced by increased farm production and a dependable municipal and industrial water supply. Table C-6 shows the predicted population growth of Montezuma and Dolores Counties with and without the project. As the table shows, the population could reach 40,060 by 2030, or about 2,600 more people than anticipated without the project.

Table C-6
Future population growth of Montezuma and
Dolores Counties

	With Dolores Project	Without Dolores Project	Percent attributable to project
1975	16,775	16,775	
1980	20,940	17,480	16
1990	24,200	22,400	7
2000	27,940	26,100	7
2010	31,420	29,570	6
2020	35,930	33,280	7
2030	40,060	37,460	6

Most of the major communities in the area are expected to grow more slowly in the future (1975-2030) than they have in the past (1930-1975). The growth rate of Cortez, for example, would decrease from a historical average of 4.7 percent annually to about 2.3 percent annually, and that of Dove Creek would decrease from 2.8 to 1.4 percent. Growth in Towaoc is also expected to decrease, from 2.2 to 1.1 percent, but Dolores should continue to grow at its historical average rate of 1.2 percent annually. The estimated populations under project conditions are shown in Table C-7.

Table C-7
Estimated future population growth
of major communities

	Cortez	Dove Creek	Dolores	Towaoc
1975	7,280	625	970	1,300
1980	10,300	880	1,120	1,470
1990	12,300	900	1,320	1,650
2000	15,200	1,000	1,380	1,780
2010	18,100	1,100	1,450	1,950
2020	21,800	1,220	1,670	2,150
2030	25,300	1,320	1,870	2,360

b. Housing

During construction, the expected tight housing market could inflate housing costs. This type of inflation would be particularly felt by those low-income and fixed-income families who occupied rental housing. The population increase of 2,600 people attributable to the project by 2030 would, at an average of 3.2 persons per family, create a need for over 810 new housing units in addition to the 6,500 units which would be required to house the expected population growth even if the project were not constructed. Demands for recreational and seasonal housing would also increase. During construction, the population increase attributable to the project could reach a peak of about 3,680 in the fifth year of work if all employees brought families with them. Based upon an average of 3.2 people per family, about 1,150 housing units would be needed. Part of this demand could be met through existing vacancies (in 1970 there were 581 year-round and 177 seasonal vacancies in the area). It is expected, however, that mobile homes would meet much of the increased demands, although facilities such as roads and hookups for electric, gas, water and sewer lines would have to be expanded to accomodate any significant growth in the number of mobile homes. In addition to the housing needs to meet population growth, the 41 families displaced by the project at McPhee Reservoir would need housing. These needs would be met by upgrading present available housing outside of the basin to meet minimum standards of the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 and other appropriate Federal legislation and regulations, relocating and upgrading houses from the reservoir basin, and constructing replacement housing in accordance with the provisions of the law.

Those people desiring to be relocated in the project area would suffer the discomforts generally associated with short distance moves. The homes they would move to, however, would be structurally at

least equal to the ones abandoned. Although any families electing to relocate outside the project area would also receive replacement housing, the immediate impact upon their lives could be more keenly felt since relocating out of the area would probably necessitate changes in occupation, friends, and even lifestyle. The project would have no other significant impact on the future need for housing replacements.

c. Community Facilities and Services

(1) General

Impacts on community facilities and services would closely parallel employment trends. While many community facilities and services are adequate for present demands, most are experiencing the impact of current growth trends. The construction of the project would cause present facilities to become inadequate much sooner than they would have without the project. Following construction the general growth trend in the area and the need for new facilities would not be significantly affected by the project in the long term. Although the area as a whole would not experience a post-construction decline, some isolated incidents of temporary overdevelopment could occur. The relatively long 9-year construction period would tend to minimize these impacts.

(2) Education

Construction of the project should not substantially affect the educational level of the area but could temporarily create a strain on the existing educational facilities and may possibly require some expansion in facilities. Most of the schools in Dolores County are old structures, and those of Montezuma County are, for the most part, newer buildings with some excess capacity. The superintendents of the two districts in the area have indicated that they have an existing capacity and staff to accommodate up to 300 additional students with no major change in the existing student-teacher ratio of 22:1, provided that the grade distribution of the new students was approximately consistent with the existing distribution. The number of new students attributable to project construction would be 29 in the first year, increase to 1,288 in the fifth year, and decrease to 346 in the last year, assuming that 35 percent of the people moving to the area were school-aged children. This temporary growth would result in larger classes. In the peak construction year, an influx of 1,288 new students would increase the student-teacher ratio from the present 22:1 to 28:1. This increase would be within generally accepted classroom standards. There would therefore be no absolute need for new teachers or classroom facilities. In fact, given the short-term nature of the student influx, the school districts would probably use their existing facilities as much as possible and would not undertake any substantial expansion. Payment of the costs associated with the increased students, which could vary considerably depending upon the methods taken by the school districts to handle a short-term influx, would be distributed among local taxes, State funds, and Federal impact aid funds available under Public Law 81-874

and subsequent amendments to alleviate the effects of Federal projects. Montezuma-Cortez School District Re-1 estimates that its authorized revenue base is now \$1,043.02 per student, that the State pays 63 percent of this cost (\$657.10 per student), and that the Federal aid would be about \$300 per student. Following construction the temporary demand for increased educational facilities would decrease. Predicted long-term growth trends would gradually absorb any capacity added to the school systems to meet the construction needs.

(3) Police and Fire Protection

A maximum of 7 new professional police officers would be needed in the area during the project's construction phase to maintain present levels of service, based on a general planning rate of 1.9 positions per 1,000 people. There are no professional fire protection personnel in the area, and the present volunteer units would need to expand to meet expected growth rates with or without the project. In the long-term, the project effects would not be significant since the population increase resulting from the project would only be 2,600 people by the year 2030.

(4) Water and sewage

An additional strain would be placed on water and sewage facilities. Sewage treatment facilities for the city of Cortez have an excess capacity rating and could sustain a substantial amount of population growth. The city's existing municipal water supply is used at near capacity, however, and by 1980 the city would need additional water. Both the sewage and water facilities for the town of Dolores and rural areas must be expanded to meet any future growth. Although the population influx related to project construction would increase the strain on these facilities, only with the project could the area meet the demands of its projected long-range growth. The towns that have requested water have indicated that the temporary strain placed on the facilities due to the construction of the project are out-weighed by the future benefits of providing municipal and industrial water. Some rural areas would improve their sewage and domestic water sources and facilities because of the development of project water. The Bureau would enter into a contract with the town of Dolores for the design and construction of a new treatment facility that would meet applicable health standards, as described in Chapter A.

(5) Health

Current health manpower and facilities in the project area, as in most rural areas, are below the overall national levels. The influx of construction workers could place a strain on the present capabilities. In the long term, the predicted increase of 2,600 people resulting from the project operations would also create a need for slightly expanded health services.

d. Employment and Incomes

During the 9-year construction period the project would provide a total of about 6,270 jobs in direct employment, beginning at about 30 in the first year, rising to a maximum of 1,300 in the fourth or fifth year, then gradually declining to 350 in the final year. These estimates are based on the assumption that each job would be full time during a 9-month construction season. About 85 percent of these man-years would be filled by predominantly skilled labor from outside the area, and the remaining 15 percent would be filled by predominantly unskilled labor from the local area. The construction period would also result in about 4,390 jobs of indirect employment to provide goods and services for those employed directly. This indirect employment, about 95 percent of which would come primarily from the local area, could reach 910 jobs during the peak year of construction. Although it would not cause a large flow of capital into the area, it would act to increase the dispersal of the Federal money made available by construction. Both the direct and indirect job opportunities would reduce seasonal and year-round unemployment, as well as underemployment.

Operation and maintenance would require 21 full-time employees, and additional long-term jobs would result from project irrigation. Approximately 9 man-years of temporary employment would be generated annually by the operation and management of new recreational resources. Almost all of the positions would be of a highly seasonal nature. As pointed out in Chapter A, some of the dry farms in the Dove Creek area have acreage in excess of the amount for which project water could be provided. In order for all the acreage to receive project water, the present owners would be required to dispose of excess land, creating new farm job opportunities for new owners. The irrigated land on the reservation, which would be operated as a unit by the tribe, would provide the Indians with both full-time and seasonal employment for managing, planting, irrigating, and harvesting.

According to current cost estimates and construction scheduling, a total of \$178.2 million would be spent over the 9-year construction period. Based on the Bureau of Reclamation's past experience with similar projects, an estimated \$71.3 million would be spent on local salaries, rising rapidly from \$340,000 in the first year to a peak of approximately \$14.7 million in the fourth or fifth year. Local salaries would then decline to \$4 million in the final year. Since Cortez serves the area as a local trade center, most of the salaries would be spent in that vicinity.

e. Welfare

By providing both short- and long-term employment for residents of the area, the project should slightly decrease welfare participation. Considering the timing of the project and the expected long-term growth of the area, no significant economic letdown is anticipated after the completion of construction.

f. Industrial Resource Base

(1) Construction

The Dolores Project would affect the construction industry, agriculture, and recreation. During the 9-year construction period, approximately \$178.2 million would be spent on construction of the project. Over 40 percent of these expenditures, in labor and construction materials, would be spent within the project area.

(2) Agriculture

(a) General Effects

Project water would be used to bring 35,360 acres of land under irrigation, consisting of 27,860 acres of land now dry-farmed in the Dove Creek area and 7,500 acres of undeveloped land in the Towaoc area. The construction of project facilities, however, would remove 1,218 acres of dry cropland and 2,324 acres of irrigated land from production (see Table C-4). Consequently, the overall project effect would be an increase of 33,036 acres of irrigated land and a decrease of 29,078 acres of dry cropland.

With irrigation, the farmers in the Dove Creek and Towaoc areas would probably develop the same general beef and dairy enterprises now characteristic of Montezuma Valley. Land utilization would be improved, and livestock numbers and feed production would be increased. Irrigation would generally increase the diversity and flexibility of crop production, so that the farm income would not depend upon the success or failure of just one major crop. With several crops produced, gains in one could balance losses in another during any given year. The increased security thus provided would create a larger incentive for owners to stay on the farm.

Since the available range land is already fully utilized, the additional feeds required for livestock would be produced essentially from the newly irrigated land. It is anticipated that the majority of farms in the Dove Creek area would combine cash crops with the winter feeding of beef calves which would be sold in the spring. Cow-calf operations would also be important. The Towaoc area would also be developed for a combination of cash crops and livestock feeds. Cow-calf operations and winter feeder calves would comprise the most significant agricultural activity.

Most of the irrigated acreage would be utilized to produce alfalfa, pasture, barley, and corn silage, as shown in Table C-8. Pinto beans and wheat would still be cultivated in the Dove Creek area, but in considerably less acreage than under the present dry-farm conditions. Small orchards would be grown in Montezuma Valley and the Dove Creek area, particularly in the southern portion.

Table C-8
Present and projected crop distribution
(percent of area)

	Dove Creek		Montezuma Valley		Towaoc	
	Without project	With project	Without project	With project	Without project	With project
Alfalfa		60	26	52		60
Wheat	18	6		5		6
Malt barley		5	7	14		5
Feed barley		1	2	1		1
Corn silage		6	2	3		6
Beans	68	11		2		11
Rotation						
pasture		4	55	15		4
Orchard		2	3	2		2
Idle or						
follow	12					
Farmstead or						
waste	2	5	5	6		5
Grazing					100	

The availability of project water from storage would enable the farmers in the area to improve a number of farm management practices. The increased dependable water supply, the additional use of fertilizer for irrigated crops, and other farm management improvements would result in larger crop yields per acre in all three project areas. Gross agricultural production would be increased by approximately \$1,175,000 annually in the Montezuma Valley area, \$11,726,000 annually in the Dove Creek area, and \$5,489,000 annually in the Towaoc area, for a project total of \$18,390,000 annually. Moreover, secondary growth would also be expected in local business through increased pressure to supply a growing demand for goods and services.

The net annual income of the Ute Mountain Ute Indian Tribe, would be increased by about \$1.3 million, which would help to supplement the nearly depleted tribal funds received for oil, uranium, and gas leases on the reservation. After the conversion to irrigated farming in the Dove Creek area the farmers' net annual incomes would be increased by about \$3 million. Farm income should be more consistent than at present since a lack of rainfall now often decreases crop yields and farm incomes. Supplemental irrigation in the Montezuma Valley area would annual increase net farm incomes by \$400,000.

(b) Agricultural Chemicals

The project would significantly increase the total use of pesticides in the area by providing irrigation on 7,500 acres of uncultivated desert and 27,860 acres of dry-farmed land where the current use of pesticides is negligible. Pesticide use on supplemental service land should not increase significantly. Table C-9 shows the expected increases in various types of insecticides and herbicides. The organophosphorous insecticides such as parathion and diazinon generally disappear from the soil within 2 months of application. Overall, pesticide levels in return flows should not increase significantly as discussed in the water quality section of this chapter.

Table C-9
Estimated annual pesticide use

	Without project	With project	Increase
Insecticides			
Furadon (pints)	5,000	17,446	12,446
Parathion (lbs.)	2,500	8,723	6,223
Guthion (lbs.)	160	1,220	1,060
Diazinon (lbs.)	214	1,628	1,414
Herbicides			
2,4-D (lbs.)	1,084	-	2,347
Edtam (lbs.)		1,103	1,103
Treflan (lbs.)		1,103	1,103
Atrazine (lbs.)		4,897	4,897

The Federal Environmental Pesticide Control Act of 1972 contains provisions designed to safeguard the environment by registration and classification of pesticides and certification procedures for pesticide applicators. EPA's pesticide registration and certification program will be fully implemented by October 1977. Only fully registered and labeled pesticides would be used by certified applicators on the project, and significant adverse effects on nontarget species are not expected.

The use of fertilizers would not increase significantly in the supplemental service area, but would increase significantly on the Dove Creek and Towaoc lands. Phosphate use would be increased by an estimated total of 2,980 tons, and annual nitrogen use would be increased by 2,140 tons. These, however, should not contribute significant amounts to runoff water, as discussed earlier in this chapter.

g. Recreation

The project would provide recreational facilities and opportunities, accommodating boating, swimming, water skiing, picnicking and camping, fishing, and hunting. These opportunities would affect the area by fulfilling needs for recreation and leisure, stimulating the economy to provide services and goods for recreation users and increasing pressure on the natural resources of the area such as vegetation, wildlife, and water resources. As Table C-10 shows, annual outdoor recreation use attributed to the project would average about 290,000 recreation days.

Table C-10
Anticipated recreation use
attributable to the Dolores Project^{1/}
(recreation days)

Feature	General recreation
McPhee Reservoir	186,600
Dolores River below McPhee Dam	80,500
Monument Creek Reservoir	22,900
Total	290,000

^{1/} Includes loss of up to 1,472 boater-days annually.

The project would adversely affect white-water boating opportunities. Boating flows would probably be unavailable while McPhee Reservoir was filling, and in the long term the project would reduce average annual launching days from 54.6 to 23.9. Consequently, annual boating use would decrease from an estimated 2,805 boater-days^{1/} to somewhere in the range of 1,333 to 1,937 boater-days, depending upon the effectiveness of efforts to make the most efficient use of available flows through grouping in periods of 5 or more consecutive days and public awareness of forecasted flows. If the scheduling and prediction program for releases produced about the same utilization of available flows as in the past, the estimated use would be only 1,333 boater-days. If, however, the program caused an increase in the use of the launching days^{2/}, the boater days could amount to 1,937. This figure is based on a maximum use rate of 80 percent of the flows during May 21 to June 10, the most popular boating period. Based upon the 46-year study period, the project would result in 24 years with no boating opportunities, compared to 2 years without the project. Table C-11 shows the estimated use of the river with and without the project.

Table C-11
Project impacts
on average white-water boating use

Occurrence	Without project		With project low estimate		With project high estimate	
	Launching days	Boater days	Launching days	Boater days	Launching days	Boater days
April 15-30	11.3	122	2.4	26	2.4	26
May 1-20	14.6	394	9.2	247	9.2	247
May 21-June 10	16.3	1,986	7.7	935	7.7	1,539
June 11-30	10.4	280	4.6	125	4.6	125
July 1-	2.0	22	0	0	0	0
Total	54.6	2,805	23.9	1,333	23.9	1,937

The reduced boating would adversely affect commercial outfitters using the river. Based upon the Guidelines of the Water Resources Council, the Bureau of Reclamation has estimated the act value of a boater-day at \$9.^{3/} With a decrease of between 868 and 1,472 boater-days annually, these enterprises could lose \$7,812 to \$13,248 annually on the Dolores River. During about 24 out of every 46 years, no income would be available from Dolores River trips, since boating flows would not occur. The degree to which these losses could be compensated for by increased use of other rivers has not been estimated.

^{1/} A boater-day is defined as one person boating for any significant amount of time during a launching day.

^{2/} A launching day is defined as the occurrence of riverflows of 500 second-feet or greater during the snowmelt runoff. Under project conditions all launching days would occur in groups of 5 or more consecutive days.

^{3/} Water Resources Council, "Water and Related Land Resources," Federal Register, Vol. 38, No. 174 (Monday, September 10, 1973), page 24804.

Overall, the project is expected to have a beneficial effect on the Dolores River below McPhee Dam as a part of the National Wild and Scenic Rivers System if it is so designated. Although the regulation of riverflows would decrease the total number of boating days in an average year, it would enhance the stream for fish and wildlife and forms of recreation other than whitewater boating. In addition, five of the proposed recreation sites on the river (Williams Draw, Mountain Sheep Point, Slick Rock, Little Gyp Valley, and Bedrock) would be needed "to meet recreation development of the Wild and Scenic River proposal."^{1/}

Fishing opportunities would be created in the three project reservoirs and in the Dolores River below McPhee Dam. Existing opportunities also would be increased in Groundhog Reservoir and in stream sections below the reservoir. The project would also improve hunting opportunities. All three reservoirs would provide waterfowl hunting, and Monument Creek and Dawson Draw Reservoirs would provide upland game hunting as well. Additional opportunities for upland game hunting would be provided by cover and feed habitat planted along the canal rights-of-way. Table C-12 summarizes anticipated increases in hunting and fishing opportunities.

Table C-12
Annual fishing and hunting use
attributable to the Dolores Project
(man-days)

Feature	Fishing		Hunting	
	Without project	With project	Without project	With project
McPhee Reservoir	0	52,000		
Big game (units 71, 72, & 73)			29,100	29,100
Upland game			0	0
Waterfowl			0	500
Wildlife oriented activities			0	10,000
Dolores River below McPhee	0	38,000		
Monument Creek Reservoir	0	1,500		
Upland game			0	300
Waterfowl			0	200
Wildlife oriented activities			0	500
Dawson Draw Reservoir	0	35,000		
Upland game			0	1,500
Waterfowl			0	2,500
Wildlife oriented activities			0	15,000
Groundhog Reservoir	10,000	27,600		
Groundhog Creek	3,000	5,400		
West Dolores River	5,000	9,000		
Dolores River above Dolores	5,000	6,600		
Dove Creek area				
Upland game			300	1,100
Montezuma Valley area				
Upland game			500	1,000
Total	23,000	175,100	29,900	61,700

^{1/} Dolores Wild and Scenic River Study Report, December 1975, pages 97-98.

h. Public Finance and Tax Base

Project development would cause some significant changes in the assessed valuation of land in Montezuma and Dolores Counties, as shown in Table C-13. The assessed valuation is projected to increase by more than \$15 million by the end of 1990 and almost 200 million by 2030. These increases would occur from increased agricultural values, municipal and industrial water, the development of raw land for recreational or summer home use, the subdivision of small acreages for homes, the expansion of retail and wholesale trade in the area, and the expansion of the services industry. All of these effects would cause an estimated 5 percent annual growth in the tax base from 1978 to 1991. Following the completion of the project development period in 1991, growth is expected to proceed at approximately 4 percent annually as a result of continued inflation as well as continued economic growth in the area.

Table C-13
Assessed valuation

	With the project	Without the project
1975	\$41,354,000	\$41,354,000
1978	44,861,000	44,861,000
1980	49,459,000	47,593,000
1990	80,564,000	63,962,000
2000	120,401,000	85,960,000
2010	178,222,000	115,522,000
2020	263,812,000	155,253,000
2030	390,505,000	208,644,000

The land acquired for the project would be removed from the tax rolls, causing a loss in revenues of about \$7,000 annually in taxes on private property. This effect is negligible when compared to the significant increase in valuation and taxes of about \$625,000 annually derived from the conversion of 27,860 acres to irrigation in the Dove Creek area.

i. Flood Control

By reducing the high spring runoff of the Dolores River, the project would reduce flood-related damages by an average of \$50,000 annually, consisting of \$4,800 from McPhee Dam to the mouth of the San Miguel River and \$45,200 from the mouth of the San Miguel to the mouth of the Dolores.^{1/} The estimates are based upon historical and potential damage involving the following structures and improvements along the river.

^{1/} Correspondence from the Department of the Army, U.S. Corps of Engineers to the Bureau of Reclamation, November 20, 1974.

Dollar value based on 1974 price levels, a 3 1/4 percent interest rate, and a 100-year period of analysis.

- (1) Agricultural property that includes cultivated fields and pasture lands, crops, fences, ditches, farm equipment, and farm and ranch buildings, excluding residences.
- (2) Residential property that includes town, farm, and ranch residences, and their contents.
- (3) Business property that includes country stores, rental cabins, service stations, and their contents.
- (4) Highways and roads that include State highways and county and local roads.
- (5) Highway and road bridges that include State highway bridges and private bridges.
- (6) Utilities that include water, gas, electrical, and telephone lines.
- (7) Irrigation works that include diversion structures and canals, excluding field ditches.

j. Summary

During the construction period, the Dolores Project would provide opportunities for employment among local residents, but the influx of construction workers and their families from the outside would also put additional stress upon municipal and public facilities such as housing, schools, police, and fire protection, health care, water and sewage treatment, and utilities. In the long-term, however, the project would not only supply much needed municipal and industrial water but would also substantially increase tax bases and business opportunities and income, creating, in turn, the economic climate for expansion and improvement of municipal and public facilities.

The agricultural sector of the local population would be provided a reliable irrigation water supply, thus increasing production and permitting crop diversity. The Ute Indian Tribe would be provided a new source of tribal income with the establishment of irrigated agriculture on its lands.

14. Cumulative Impacts

a. Introduction

The Bureau of Reclamation is undertaking preparation of a comprehensive environmental statement covering Reclamation activities along the entire Colorado River. That statement will assess the environmental impacts resulting from operation and maintenance activities on existing projects and proposed further actions on existing projects.

In addition, it will assess the significant cumulative impacts expected in about the next 25 years whether they come from operation of existing projects, projects under construction, projects proposed for construction, or projects under study in the Colorado River area. The comprehensive statement also will be responsive to issues raised by several environmental groups, including among others the Environmental Defense Fund, Colorado Open Space Council, Trout Unlimited, the Island Foundation, the Sierra Club, and the Wilderness Society.

The statement will require some time to prepare if it is indeed to be comprehensive in scope and depth. In order to give as much data as is now available, however, the following discussions are prepared as an appraisal of the cumulative impacts in the Upper Colorado River Basin of 19 units and participating projects of the Colorado River Storage Project (hereinafter designated CRSP) which are constructed or under construction and five developments which are scheduled for the start of construction in 1977 pending compliance with the National Environmental Policy Act, including three of CRSP and two of the Colorado River Basin Salinity Control Project. Except for salinity, the analysis does not extend to any authorized developments planned for construction starts beyond 1977 as firm data for such projects are not available.

The base for the discussions, termed the 1976 modified base, is a hypothetical condition which includes actual conditions to 1976 with modifications for effects of developments which are under construction. The base includes many Federal and private developments but the effects of CRSP are broken out and analyzed separately. In turn the cumulative effects of the five developments scheduled for construction starts in 1977 pending compliance with the National Environmental Policy Act are analyzed as an increment to the 1976 modified base condition. The comparisons of project conditions with the assumed base conditions are admittedly imprecise. They are based on the best data currently available, however, and give some perspective to impacts of Reclamation developments in the Upper Colorado River Basin.

The individual developments included in the appraisal are listed in Table C-14 and shown on the map in Figure C-3. The dates of authorization and actual or anticipated dates of completion are listed with the projects. Although some of the developments are not scheduled for completion for several years, they are considered as in place since their construction has been started and in some cases is well along.

Two of the developments listed, the Bonneville Unit of the Central Utah Project and the San Juan-Chama Project, would involve diversions of water out of the Colorado River Basin. Essentially all of the water of the San Juan-Chama Project would be delivered to the Rio Grande River Basin in New Mexico. Water of the Bonneville Unit would be used both in the Uinta Basin of Utah, which is part of the Colorado River Basin, and in the Bonneville Basin of Utah, which is a part of the Great Basin.

Table C-14
Developments included in cumulative impact analysis

	<u>Actual or estimated completion date</u>
<u>CRSP developments constructed or under construction</u>	
<u>Storage Units--Act of April 11, 1956</u>	
Curecanti, Colo.	
Blue Mesa Dam, Reservoir, and Powerplant	1966
Morrow Point Dam, Reservoir, and Powerplant	1970
Crystal Dam, Reservoir, and Powerplant	1977
Flaming Gorge, Wyo.	1963
Glen Canyon, Utah and Ariz.	1965
Navajo, N. Mex.	1963
<u>Participating projects</u>	
<u>Act of April 11, 1956</u>	
Florida, Colo.	1963
Paonia, Colo.	1962
Silt, Colo.	1966
Smith Fork, Colo.	1963
Hammond, N. Mex.	1975
Central Utah, Utah	
Bonneville Unit	1996
Jensen Unit	1986
Vernal Unit	1961
Emery County, Utah	1965
Lyman, Wyo.	1980
Seedskadee, Wyo. (Fontenelle Dam and Powerplant)	1964
<u>Act of June 13, 1962</u>	
Navajo Indian, N. Mex.	1987
San Juan-Chama, Colo. and N. Mex.	1983
<u>Act of September 2, 1964</u>	
Bostwick Park, Colo.	1971
<u>Act of September 30, 1968</u>	
Dallas Creek, Colo.	1981
<u>Developments scheduled for construction starts in 1977</u>	
<u>Act of September 2, 1964</u>	
Fruitland Mesa, Colo. (CRSP)	1986
Savery-Pot Hook, Colo. and Wyo. (CRSP)	1984
<u>Act of September 30, 1968</u>	
Dolores, Colo. (CRSP)	1988
<u>Act of June 24, 1974</u>	
Grand Valley Unit, Colo. (Colorado Basin Salinity Control Project)	1987
Paradox Valley Unit, Colo. (Colorado Basin Salinity Control Project)	1984

EXPLANATION

C.R.S.P. units and participating projects

- ▲ Constructed projects
- Projects under construction
- ★ Projects scheduled for construction starts in 1977
- ★ Colorado River Salinity Control Units scheduled for construction starts in 1977

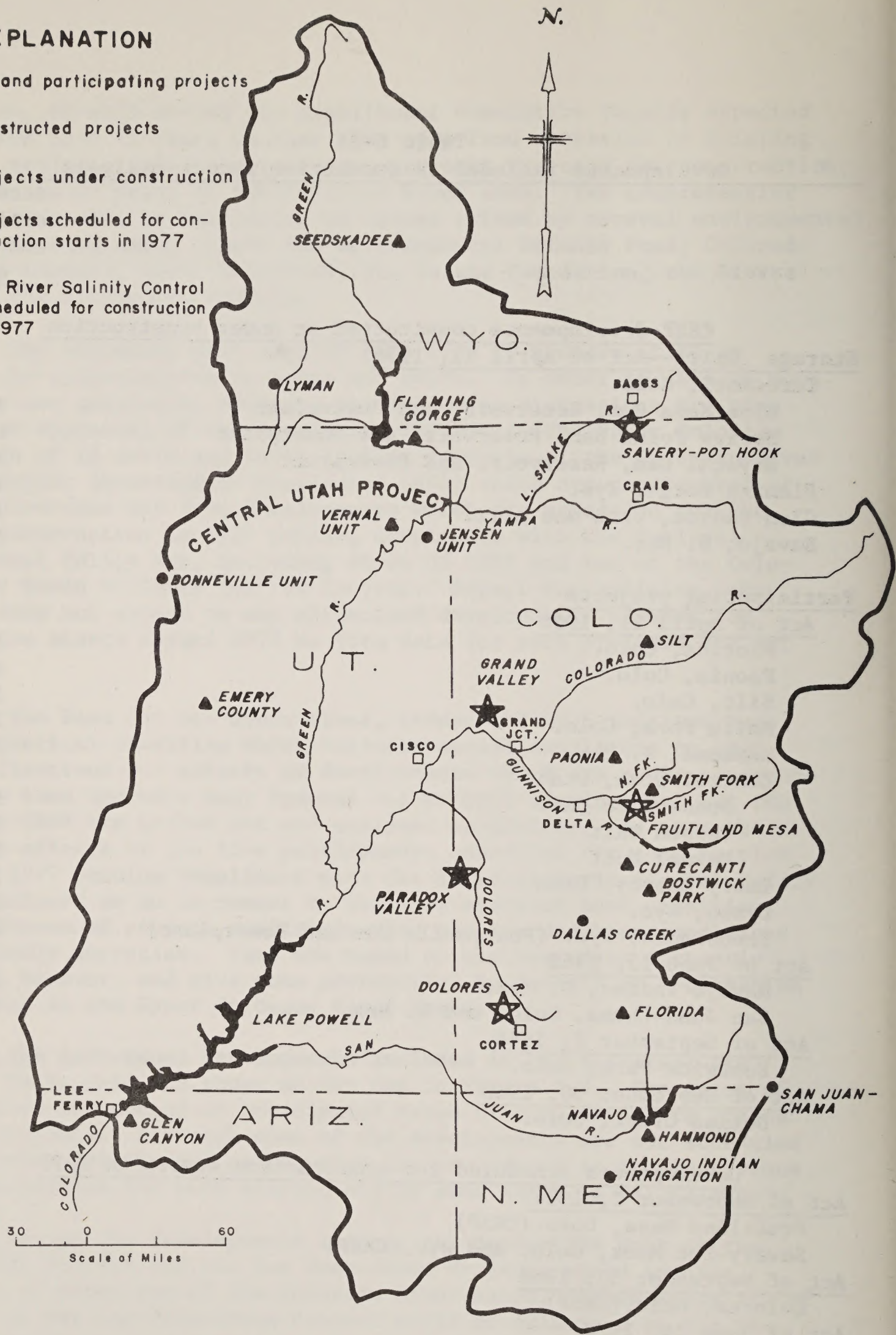


Figure C-3 UPPER COLORADO RIVER STREAM SYSTEM

The discussions of cumulative impacts are based on numerous reports of the Bureau of Reclamation and Federal, State, and local agencies. The references are so numerous that they could not all be identified in this section, but they are included in the Bibliography in Section I.4.

b. Socio-Economic Conditions

(1) Crop Production

(a) CRSP Developments Constructed or Under Construction

The contribution to crop production of CRSP developments constructed or under construction is large, amounting to a value of nearly \$26 million annually, or about 25 percent of the total crop production in the basin with assumed ultimate development of the CRSP projects considered (1976 modified base). Additional crop production from water exported from the Colorado River Basin under the Bonneville Unit and San Juan-Chama Project would have a value of nearly \$15 million annually. A project-by-project comparison of crop production is shown in Table C-15 along with data used for comparisons. The value of water for irrigated pasture and the value of livestock and livestock products have not been included in either the base or the CRSP project evaluations because comparable data is not available. As a general rule in the upper basin, however, it can be stated that the value of crop production is only about a third of the gross agricultural production and the value of livestock and livestock products accounts for the remaining two-thirds. Thus the total value of agricultural production in the upper basin from CRSP developments constructed or under construction is roughly estimated at about \$80 million annually, with an additional value of about \$45 million outside of the basin.

(b) Developments Scheduled for 1977 Construction Starts

The five developments scheduled for construction starts in 1977 would contribute nearly \$10 million in additional agricultural crop production or about 9 percent of the basin's crop production in the 1976 modified base. A comparison of crop production that would result from the five projects is shown in Table C-16. Based on the assumption that crop production represents only about a third of the total agricultural production, the value of gross agricultural production from the five projects is estimated at about \$30 million.

(2) Power

The capability for power production from CRSP projects constructed or under construction is estimated at slightly more than 6 million megawatt-hours. This is equivalent to nearly 10 percent of the 1975 power consumption in the CRSP power marketing area which includes the entire States of Arizona, Colorado, New Mexico, Wyoming, and Utah, as well as three southwestern counties of Nevada and a small portion of California. The comparison of project capability and consumption in the market area is shown in Table C-17. On the basis of an average annual

Table C-15
Summary of annual gross crop values
from CRSP projects constructed or under construction

	Irrigable acreage (acres)		Irrigation supply (acre-feet)	Gross value of crop production ^{1/}
	Full service land	Supple- mental service land		
Production in basin shown in 1969 Agricultural Census indexed to 1975				\$84,957,000
Crop production based on 1975 Bureau of Reclamation crop reports				
Curecanti Unit			No irrigation	
Flaming Gorge Unit			No irrigation	
Glen Canyon Unit			No irrigation	
Navajo Unit			No irrigation	
Florida Project	5,730	13,720	26,000	1,057,000
Paonia Project	2,230	13,070	20,000	1,352,000
Silt Project	2,120	4,480	13,000	548,000
Smith Fork Project	1,420	8,060	10,000	251,000
Hammond Project	3,900		19,000	733,000
Bonneville Unit ^{2/}		26,450	22,700	802,000
Jensen Unit ^{2/}	440	3,640	5,000	167,000
Vernal Unit		14,781	18,000	602,000
Emery County Project	770	17,210	22,000	473,000
Lyman Project		46,670	49,000	486,000
Navajo Indian Irrigation Project ^{2/}	100,000		330,000	19,256,000
Bostwick Park Project	1,320	4,290	11,000	305,000
Dallas Creek Project ^{2/}		20,850	11,200	622,000
Seedskadee Project			No irrigation	
Subtotal	117,930	173,221	556,900	26,654,000
Crop production in both 1969 and 1975 reports				-5,016,000
Total crop production in basin (1976 modified base)				106,595,000
Percent of crop production in basin from CRSP developments				25
Crop production out of basin				
Bonneville Unit				
Bonneville Basin	29,370	186,720	184,300	11,303,000
San Juan-Chama Project				
Rio Grand Basin ^{2/}		84,380	61,300	3,577,000
Subtotal outside of basin	29,370	271,100	245,600	14,880,000
Total in and outside of basin	147,300	444,321	802,500	41,534,000

^{1/} Exclusive of irrigated pasture and livestock production.

^{2/} Based on 1975 per acre values for nearby existing projects.

Table C-16
Summary of annual gross crop values from developments
scheduled for 1977 construction starts

Time frame	<u>Irrigable acreage</u>			Gross value of crop production ^{1/}
	Full service land	Supple- mental service land	Irrigation supply (acre-feet)	
1976 modified base				\$106,595,000
Projects scheduled for 1977 construction starts				
Savery-Pot Hook Project	14,410	14,330	53,600	1,599,000
Fruitland Mesa Project	11,940	6,310	43,100	1,724,000
Dolores Project	35,360	26,300	90,900	5,595,000
Grand Valley Unit				^{2/} 1,000,000
Paradox Valley Unit				no irrigation
Subtotal	61,710	46,940	187,600	9,918,000
Total				116,513,000
Percent of 1976 modified base				9

^{1/} Exclusive of irrigated pastures and livestock production.

^{2/} Represents increased production on existing Grand Valley Project that would result from decreased salinity levels.

use of 2,600 kilowatt-hours per capita, the CRSP power generation from projects constructed or under construction would be sufficient to meet residential needs of more than 2.3 million people or, from another perspective, could supply the entire estimated residential needs in the State of Arizona. No power would be generated by the developments scheduled for construction starts in 1977.

Table C-17		
Power capability of CRSP projects constructed or under construction compared with 1975 consumption in market area		
	Capacity	Generation ^{1/}
	(MW)	(MWh)
Project capability		
Curecanti Unit		
Blue Mesa	60	268,984
Morrow Point	120	365,664
Crystal	28	173,000
Flaming Gorge Unit	108	604,903
Glen Canyon Unit	950	4,233,668
Bonneville Unit	133	300,670
Seedskadee Project	10	63,912
Navajo Indian Project	23	118,000
Total	1,432	6,128,801
1975 consumption ^{2/}		
State		(MWh)
Power market area		
Arizona		20,468,000
California		N/A
Colorado		15,792,000
Nevada		7,672,000
New Mexico		6,748,000
Utah		7,644,000
Wyoming		4,452,000
Total		62,776,000

^{1/} Based on 19th Annual Report, Colorado River Storage Project and Participating Projects for Fiscal Year 1975 for projects completed.

^{2/} Based on the 1975 Energy Production System in the States of the Rocky Mountain Region by Charles D. Kolstad, Los Alamos Scientific Laboratory of the University of California.

(3) Municipal and Industrial Water

(a) CRSP Developments Constructed or Under Construction

The municipal and industrial water supply for CRSP developments constructed or under construction amounts to a total of 541,500 acre-feet annually, including about 216,500 acre-feet for municipal uses and 325,000 acre-feet for industrial use. Based on an estimated annual per capita use of 0.25 acre-foot, the water for municipal use

could supply the domestic water for a population of about 860,000 or a city about the size of Denver, Colo. Essentially all of the industrial water has been sold. The largest single use is for steam-electric power generation. The supply available from individual projects is shown in the table below.

Table C-18
Municipal and industrial water supply--
CRSP developments constructed or under construction
(Unit--acre-feet)

For use within Upper Colorado	
River Basin	
Glen Canyon Unit	142,000
Navajo Unit	64,000
Central Utah Project	
Jensen Unit	18,000
Vernal Unit	2,000
Emery County Project	6,000
Lyman Project	1,500
Seeds-kadee Project	120,000
Dallas Creek Project	28,000
Subtotal--use in basin	<u>381,500</u>
For use outside Upper Colorado	
River Basin	
Bonneville Unit	99,000
San Juan-Chama Project	61,000
Subtotal--use outside of basin	<u>160,000</u>
Total use	<u>541,500</u>

(b) Developments Scheduled for Construction Starts in 1977

Of the five developments scheduled for construction starts in 1977, only the Dolores Project would provide water for municipal and industrial use. It would develop 8,700 acre-feet for residential use in local communities.

(4) Recreation

(a) CRSP Developments Constructed or Under Construction

CRSP developments constructed or under construction will provide more than 5 million man days of recreation use annually within the Upper Colorado River Basin, as shown in Table C-19. This constitutes an estimated 12 percent of the overall recreation use within the basin, assuming all CRSP developments are in place (1976 modified base). The greatest contribution from CRSP comes in the area of water related recreation which is limited in the largely semiarid to arid Upper Colorado River Basin. This is borne out in the table which shows 29 percent of the fishing, 25 percent of the boating, and 14 percent of the camping in the basin is at CRSP developments. From an economic

standpoint these contributions are significant since recreation and tourism is one of the major industries in the basin. In addition to recreation development in the basin, CRSP developments provide another 500,900 man days of recreation use outside the basin.

One of the tradeoffs for the new recreational opportunities has been the elimination of white water boating opportunities in the canyon sections of Lake Powell (Glen Canyon) and Flaming Gorge Reservoir. Some reservoirs, particularly Lake Powell, have adversely altered the natural splendor of the landscape by inundation, but, on the other hand, these areas now receive increased recreation use because of the improved access and facilities. For instance, it has been estimated that Rainbow Bridge at Lake Powell had been seen by no more than 20,000 people prior to CRSP^{1/}. The National Park Service now estimates that, with Lake Powell, as many as 80,000 people a year visit the bridge.

(b) Developments Scheduled for 1977 Construction Starts

Table C-20 shows that the five projects scheduled for construction starts in 1977 would increase the recreation use base by 554,450 man days (a 1.3 percent increase). The greatest increases would come in fishing, boating, and camping. Perhaps the most significant recreational tradeoff associated with these five projects would be the loss of some white-water boating opportunities below McPhee Reservoir on the Dolores River for the establishment of a perennial stream for fishing, other recreational uses, and improvement of aesthetic values.

(5) Employment Opportunities

(a) CRSP Developments Constructed or Under Construction

CRSP developments constructed or under construction account for about 4,500 permanent jobs annually, including about 4,000 jobs in agriculture and 500 associated with operation and maintenance of CRSP developments, as shown in Table C-21. Of the 4,500 jobs, about 2,800 are associated with employment in the basin and 1,700 outside of the basin. Total employment in the basin in the 1976 modified base, including CRSP developments constructed or under construction, is about 168,800, with the CRSP developments accounting for about 2 percent of the total. The impact of CRSP on agricultural employment is more significant, however, amounting to about 14 percent of the total in the 1976 modified base. Additional employment opportunities are created outside of the basin by the Bonneville Unit of the Central Utah Project and the San Juan-Chama Project.

(b) Developments Scheduled for 1977 Construction Starts

Developments scheduled for construction in 1977 would result in an increase of more than 800 permanent jobs, including about

^{1/} Sypulski, John S., "The Colorado River," Reprint from New York State Ranger School Alumni News.

struction

Hunting ^{2/}	Other ^{3/}	Total
1,403,640	9,311,940	38,905,370
110	5,070	739,610
7,900	119,300	658,800
530	91,980	1,371,350
3,910	87,660	350,890
	3,000	77,600
10	650	16,760
150	4,070	76,020
	1,520	99,100
9,150	24,400	856,800
1,200	3,200	49,500
50	7,910	60,860
3,900	16,400	175,400
1,830	5,500	83,670
600	1,650	87,250
100	200	34,700
No estimate	No estimate	353,340
29,440	372,510	5,091,650
1,433,080	9,684,450	43,999,020
2	4	12
6,900	18,410	455,310
No estimate	4,050	45,630
6,900	22,460	500,940
36,340	394,970	5,592,590

tion of five basin States involved, updated to

standpoint these contributions are significant since recreation and tourism is one of the major industries in the basin. In addition to recreation development in the basin, CRSP developments provide another 500,900 man days of recreation use outside the basin.

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^{1/} Sypulski, John S., "The Colorado River," Reprint from New York State Ranger School Alumni News.

Table C-19
Recreation use--CRSP developments constructed or under construction
(Unit--annual man days)

Project	Sightseeing	Picnicking	Camping	Boating	Fishing ^{1/}	Hunting ^{2/}	Other ^{3/}	Total
Upper Colorado River Basin								
Recreation use without CRSP (1976) ^{4/}	8,720,430	5,625,610	8,807,030	1,815,320	3,221,400	1,403,640	9,311,940	38,905,370
CRSP recreation use								
Curecanti	480,730	16,400	102,800	51,800	82,700	110	5,070	739,610
Flaming Gorge	98,000	24,000	132,300	133,600	143,700	7,900	119,300	658,800
Glen Canyon	84,140	18,900	798,300	166,700	210,800	530	91,980	1,371,350
Navajo	60,020	40,400	38,600	56,200	64,100	3,910	87,660	350,890
Florida	31,500	11,500	4,100	2,500	25,000		3,000	77,600
Paonia	4,700	3,500	4,100	1,200	2,600	10	650	16,760
Silt	17,000	3,000	16,500	6,600	28,700	150	4,070	76,020
Smith Fork	23,180	10,000	16,600	11,100	36,700		1,520	99,100
Hammond								
Central Utah								
Bonneville Unit	76,250	24,400	91,500	79,300	551,800	9,150	24,400	856,800
Jensen Unit	10,000	3,200	12,000	10,400	9,500	1,200	3,200	49,500
Vernal Unit	10,600	9,200	8,100	17,600	7,400	50	7,910	60,860
Emery County	13,800	14,200	57,800	19,700	49,600	3,900	16,400	175,400
Lyman	3,670	12,840	11,000	1,830	47,000	1,830	5,500	83,670
Seedskaadee	9,500	1,000	12,000	7,500	55,000	600	1,650	87,250
Bostwick Park	26,000	500			7,900	100	200	34,700
Dallas Creek	147,620	26,050	130,250	43,420	6,000	No estimate	No estimate	353,340
Total	1,096,710	219,090	1,435,950	609,450	1,328,500	29,440	372,510	5,091,650
Recreation use in basin with CRSP (1976 modified base)	9,817,140	5,844,700	10,242,980	2,424,770	4,549,900	1,433,080	9,684,450	43,999,020
Percent attributable to CRSP	11	4	14	25	29	2	4	12
CRSP use outside of basin								
Bonneville Unit	57,530	18,410	69,030	59,830	225,200	6,900	18,410	455,310
San Juan-Chama Project	1,920	2,940	23,040	5,380	8,300	No estimate	4,050	45,630
Total	59,450	21,350	92,070	65,210	233,500	6,900	22,460	500,940
Total CRSP use in and outside of basin	1,156,160	240,440	1,528,020	674,660	1,562,000	36,340	394,970	5,592,590

^{1/} Includes use for reservoirs and improved streams.

^{2/} Does not include hunting use on project agricultural lands.

^{3/} Includes swimming, hiking, and water skiing.

^{4/} Hypothetical value--derived from State Comprehensive Outdoor Recreation Plans for the portion of five basin States involved, updated to estimated 1976 conditions, less 1976 recreation use of CRSP developments constructed.

Hunting ^{2/}	Other ^{3/}	Total
,433,080	9,684,450	43,999,020
estimate	57,940	442,100
estimate	13,320	65,300
estimate	6,000	47,050
	77,260	554,450
,433,080	9,761,710	44,553,470
0	0.8	1.3

Table C-20
Recreation use--developments scheduled for 1977 construction starts
(Unit--annual man days)

Project	Sightseeing	Picnicking	Camping	Boating	Fishing ^{1/}	Hunting ^{2/}	Other ^{3/}	Total
Recreation use in basin with CRSP (1976 modified base)	9,817,140	5,844,700	10,242,980	2,424,770	4,579,900	1,433,080	9,684,450	43,999,020
Recreation use for projects scheduled for 1977 construc- tion starts								
Dolores	26,550	96,560	48,600	60,350	152,100	No estimate	57,940	442,100
Fruitland Mesa	10,660	8,000	16,000	5,320	12,000	No estimate	13,320	65,300
Savery-Pot Hook	2,000	8,000	12,000	12,000	7,050	No estimate	6,000	47,050
Grand Valley Unit								
Paradox Valley Unit								
Subtotal	39,210	112,560	76,600	77,670	171,150		77,260	554,450
Total	9,856,350	5,957,260	10,319,580	2,502,440	4,721,050	1,433,080	9,761,710	44,553,470
Percent increase	0.4	1.9	0.7	3.2	3.8	0	0.8	1.3

^{1/} Includes use for reservoirs and improved streams.

^{2/} Does not include hunting use on project agricultural lands.

^{3/} Includes swimming, hiking, and water skiing.

opportunities
r under construction

		CRSP		
lture		operation		
ect	Total	and main-	Other	Total
		tenance		
00	15,000		151,000	166,000
		230		230
30	150	6		156
70	370	6		376
20	90	6		96
20	90	2		92
10	60	5		65
20	100	10		110
10	30	5		35
30	170	7		177
40	190	3		193
30	170	3		173
80	930	102		1,032
10	40	2		42
10	40	2		42
00	2,400	400		2,800
80	1,380	91		1,471
40	210	37		247
00	1,600	100		1,700
00	4,000	500		4,500
00	17,400	400	151,000	168,800
14	14	100	0	2

Table C-21
Average annual employment opportunities
CRSP developments constructed or under construction

	Agriculture			CRSP operation and main- tenance	Other	Total
	Direct	Indirect	Total			
Upper Colorado River Basin without CRSP ^{1/}	12,000	3,000	15,000		151,000	166,000
Upper Colorado River Basin						
Storage units and Seedskaadee Project ^{1/}				230		230
Florida Project	120	30	150	6		156
Paonia Project	300	70	370	6		376
Silt Project	70	20	90	6		96
Smith Fork Project	70	20	90	2		92
Hammond Project	50	10	60	5		65
Bonneville Unit	80	20	100	10		110
Jensen Unit	20	10	30	5		35
Vernal Unit	140	30	170	7		177
Emery County Project	150	40	190	3		193
Lyman Project	140	30	170	3		173
Navajo Indian Irrigation Project	750	180	930	102		1,032
Bostwick Park Project	30	10	40	2		42
Dallas Creek Project	30	10	40	2		42
Subtotal	1,900	500	2,400	400		2,800
Outside of Upper Colorado River Basin						
Bonneville Unit	1,100	280	1,380	91		1,471
San Juan-Chama Project	170	40	210	37		247
Subtotal	1,300	300	1,600	100		1,700
Total	3,200	800	4,000	500		4,500
Total basin employment including CRSP 1976 modified base	13,900	3,500	17,400	400	151,000	168,800
Percent of basin employment resulting from CRSP developments	14	14	14	100	0	2

^{1/} For interrelated power operations.

770 jobs in agriculture and more than 60 jobs associated with project operation and maintenance. Temporary employment would amount to a total of more than 17,000 additional jobs over the various construction periods for the five projects. Estimated employment opportunities from the five projects are listed below.

Table C-22
Employment opportunities--
developments scheduled for 1977 construction starts

Average annual permanent employment opportunities						Total temporary employment opportunities over project construction periods
Agriculture			CRSP operation and maintenance	Total		
Direct	Indirect	Total				
1976 modified base ^{1/}	13,900	3,500	17,400	400	17,800	
Employment increases						
Fruitland Mesa Project	120	30	150	10	160	3,000
Savery-Pot Hook Project	140	40	180	10	190	2,500
Dolores Project	270	70	340	30	370	6,270
Grand Valley Unit	80	20	100	10	110	5,040
Paradox Valley Unit				4	4	700
Total	610	160	770	64	834	17,510
Percent of 1976 modified base	4	5	4	16	5	

^{1/} Based on U.S. Water Resources Council, 1975 Water Assessment Specific Problem Analysis, Upper Colorado Region, Technical Memorandum No. 2, August 1976.

c. Aquatic Wildlife

(1) Habitat Changes

(a) CRSP Developments Constructed or Under Construction

As shown in the table below, CRSP has resulted in a slight increase (estimated 1 percent) in the miles of cold water fishery (primarily supporting trout) in the Upper Colorado River Basin and a significant decrease (estimated 34 percent) in the miles of warm water fishery (primarily supporting catfish and nongame species). In total, these changes constitute an estimated 6 percent reduction in the miles of sport stream fishery of the Upper Colorado River Basin.

Table C-23
Summary of effects on stream fisheries
in Upper Colorado River Basin
from projects constructed or under construction

Type of fishery	Stream miles						(1976 Changes (per-cent) ^{3/}
	Without CRSP ^{1/}	In-undated	Changed from warm to cold water ^{2/}	De-graded	Im-proved	modified base) ^{3/}	
Cold water	7,715	133	+212	183	285	7,793	+1
Warm water	1,811	405	-212		190	1,194	-34

^{1/} Based on Upper Colorado Region Comprehensive Framework Study, Appendix XIII, Fish and Wildlife, June 1971.

^{2/} Changed as a result of storage regulation.

^{3/} Does not include degraded or improved stream miles.

A project-by-project description of the streams impacted and the reservoirs created is presented in Table C-24. The table points to some of the more significant tradeoffs which have resulted. For instance, in place of the estimated 538 miles of stream fishery inundated, CRSP impoundments create approximately 263,880 surface acres of flat water fisheries. Moreover, some of the better trout stream fishing in the Upper Basin States has been created downstream of a number of the CRSP reservoirs. Fifteen miles of the Colorado River below Glen Canyon, 73 miles of the Green River below Fontenelle, 26 miles of the Green River below Flaming Gorge, and 18 miles of the San Juan River below Navajo are rated as good to excellent trout stream fisheries whereas before CRSP they were rated primarily as poor to fair warm water fisheries. In contrast to the creation of the cold water stream fishery areas, important adverse impacts to the coldwater stream fishery of the Upper Colorado River Basin are the inundation of 40 miles of the Gunnison River by the Curecanti Unit, inundation of 27 miles of stream by the Bonnevillie Unit of the Central Utah Project, and degradation of about 109 miles of stream by the Bonnevillie Unit. All of these stream sections were rated good to excellent prior to inundation, with the Gunnison River section regarded as one of the better cold water stream fisheries in the entire basin.

Table C-24 shows that with the increase in the available fishing water created by the CRSP activities there has been an accompanying and significant annual increase of fishing use in the upper basin. From the standpoint of aesthetics or quality experience, it could be argued that the existing conditions after CRSP are artificial or man made and therefore no longer constitute a natural, quality fishery experience. However, it should also be recognized that although the fishing experience may be artificial, CRSP has generally improved fisherman access and provided fishing opportunities to a much greater segment of the Nation's fishing public.

Various specific fishery programs have been completed or are being planned under CRSP that are not reflected in the table. For example, two National fish hatcheries have been developed with CRSP funds. Jones Hole Hatchery in Utah produced 2.6 million trout in 1975

Project	Improved		
	Use (fisher- man days)	Flatwater fishery created	
		Acres and type of fishery ^{3/}	Estimated use (fisherman days)
Upper Colorado River			
Curecanti			
Blue Mesa City,	No estimate	{ 9,180 CW	{ 82,700 (1976)
Morrow Point es,	available		
Crystal y			
Flaming Gorge	16,900	42,000 CW	126,800 (1976)
Glen Canyon	3,800	163,000 CW and WW	207,000 (1976)
	Not available		
	Not available		
Navajo m-	40,000	15,600 CW and WW	48,500 (1976)
	Not available		
Florida (Lemon) s	5,000	600 CW	20,000 (1976)
Paonia (Paonia)	None	300 CW	2,600 (1976)
Silt (Rifle Gap)	None	350 CW	28,700 (1976)
Smith Fork (Crawf	None	400 CW and WW	36,700 (1976)
Hammond (no reser			
Central Utah			
Bonneville Uni	2,000	19,900 CW	^{5/} 549,800
Jensen Unit (T	None	500 CW	9,500
Vernal Unit (S	None	800 CW	7,400 (1976)
Emery County (Joe	None	1,200 CW	40,000 (1976)
(Huntington)	None	200 CW	8,200 (1976)
Lyman (Meeks Cabies,	1,000	500 CW	30,000 (1976)
(Stateline) e-	1,000	300 CW	17,000 (1976)
Seedskadee (Fontepa-	33,000	8,750 CW and WW	22,000 (1976)
Bostwick Park (Siows.	4,300	300 CW	3,600 (1976)
Dallas Creek (Rid	6,000	No fishery planned ^{6/}	
Total within			
No fisher			
Warm water			
Cold water			
Total	113,000	263,880	1,240,500
Outside of basin			
Bonneville	27,300	8,400 CW and WW	^{7/} 197,900
Unit			
San Juan-Chama ows	1,000	5,900 CW	7,300 (1976)
Total outsid	28,300	14,300	205,200
Total change			
outside of	141,300	278,180	1,445,700

- 1/ Table shows Colorado River Basin since the base data necessary to make an im-
- pacts analysis for a
- 2/ Quality fac
- 3/ Quality of
- 4/ Consists of Hayes, Mona, Jordanelle, Diamond Fork, and Lampton Reservoirs.
- 5/ Combination
- 6/ A reservoir public pressure forced stocking, however, an estimated 24,400 man
- days of fishing use
- 7/ Fishing use

Table C-23
Summary of effects on stream fisheries
in Upper Colorado River Basin
from projects constructed or under construction

Type of fishery	Stream miles						Changes (per-cent) ^{3/}
	Without CRSP ^{1/}	In-undated	Changed from warm to cold water ^{2/}	De-graded	Im-proved	(1976 modified base) ^{3/}	
Cold water	7,715	133	+212	183	285	7,793	+1
Warm water	1,811	405	-212		190	1,194	-34

^{1/} Based on Upper Colorado Region Comprehensive Framework Study, Appendix XIII, Fish and Wildlife, June 1971.

^{2/} Changed as a result of storage regulation.

^{3/} Does not include degraded or improved stream miles.

A project-by-project description of the streams impacted and the reservoirs created is presented in Table C-24. The table points to some of the more significant tradeoffs which have resulted. For instance, in place of the estimated 538 miles of stream fishery inundated, CRSP impoundments create approximately 263,880 surface acres of flat water fisheries. Moreover, some of the better trout stream fishing in the Upper Basin States has been created downstream of a number of the CRSP reservoirs. Fifteen miles of the Colorado River below Glen Canyon, 73 miles of the Green River below Fontenelle, 26 miles of the Green River below Flaming Gorge, and 18 miles of the San Juan River below Navajo are rated as good to excellent trout stream fisheries whereas before CRSP they were rated primarily as poor to fair warm water fisheries. In contrast to the creation of the cold water stream fishery areas, important adverse impacts to the coldwater stream fishery of the Upper Colorado River Basin are the inundation of 40 miles of the Gunnison River by the Curecanti Unit, inundation of 27 miles of stream by the Bonneville Unit of the Central Utah Project, and degradation of about 109 miles of stream by the Bonneville Unit. All of these stream sections were rated good to excellent prior to inundation, with the Gunnison River section regarded as one of the better cold water stream fisheries in the entire basin.

Table C-24 shows that with the increase in the available fishing water created by the CRSP activities there has been an accompanying and significant annual increase of fishing use in the upper basin. From the standpoint of aesthetics or quality experience, it could be argued that the existing conditions after CRSP are artificial or man made and therefore no longer constitute a natural, quality fishery experience. However, it should also be recognized that although the fishing experience may be artificial, CRSP has generally improved fisherman access and provided fishing opportunities to a much greater segment of the Nation's fishing public.

Various specific fishery programs have been completed or are being planned under CRSP that are not reflected in the table. For example, two National fish hatcheries have been developed with CRSP funds. Jones Hole Hatchery in Utah produced 2.6 million trout in 1975

Table C-24
Fishery impacts for CRSP developments constructed or under construction^{1/}

Project	Streams degraded			Stream sport fishery improved			Flatwater fishery created			
	Streams inundated		Length (miles), quality, and type of fishery ^{2/}	Reason for change	Loss of use (fisherman days)	Length (miles), quality, and type of fishery ^{2/}	Reason for change	Use (fisherman days)	Acres and type of fishery ^{3/}	Estimated use (fisherman days)
	Length (miles), quality, and type of fishery ^{2/}	Loss of use (fisherman days)								
Mainstem	Tributaries									
Upper Colorado River Basin										
Gurecanti										
Blue Mesa	23 (E) CW	24 (C) CW					Improved water quality, lower temperatures, and less turbidity	No estimate available	{ 9,180 CW	{ 82,700 (1976)
Morrow Point	11 (E) CW	0	38,000			7 (C-F) CW				
Crystal	6 (E) CW	0								
Flaming Gorge	72 (P) WW	22 (P) WW	Not available			26 (E-G) CW	Same as above	16,900	42,000 CW	126,800 (1976)
						20 (F-P) CW				
Glen Canyon	186 (F-P) WW	71 (P) WW	2,500			15 (E-G) CW	Same as above	3,800	163,000 CW and WW	207,000 (1976)
						60 (G-F) CW		Not available		
						170 (F) WW		Not available		
Navajo	35 (F) WW	18 (P) CW	Not available			18 (E-G) CW	Same as above plus improved flows	40,000	15,600 CW and WW	48,500 (1976)
						20 (F) WW		Not available		
Florida (Lemon)	3 (F) CW		100			10 (E-C) CW	Improved streamflows	5,000	600 CW	20,000 (1976)
Paonia (Paonia)	4 (P) CW		Not available			None	None	None	300 CW	2,600 (1976)
Silt (Rifle Gap)	2 (O)	1 (O)	None			None	None	None	350 CW	28,700 (1976)
Smith Fork (Crawford)	2 (O)		None			None	None	None	400 CW and WW	36,700 (1976)
Hammond (no reservoir)										
Central Utah										
Bonneville Unit ^{4/}	27 (E-G) CW		32,400	Reduced flows	110,900	5 (E) CW	Improved flows	2,000	19,900 CW	^{5/} 549,800
				Reduced flows	Insignificant					
Jensen Unit (Tyzack)	3 (C) CW		1,700	Reduced flows	100	None	None	None	500 CW	9,500
Vernal Unit (Steinaker)	0		None			None	None	None	800 CW	7,400 (1976)
Emery County (Joes Valley)	2 (G) CW	1 (G) CW	100			None	None	None	1,200 CW	40,000 (1976)
(Huntington)	0		None			None	None	None	200 CW	8,200 (1976)
Lyman (Meeks Cabin)	2 (G) CW		3,000			9 (G) CW	Improved flows, access, and stream improvement structures	1,000	500 CW	30,000 (1976)
(Stateline)	2 (G) CW		1,000			11 (G) CW		1,000	300 CW	17,000 (1976)
Seedskadee (Fontenelle)	17 (P) WW	2 (F) WW	190			73 (E) CW	Improved flows, temperatures, and turbidity	33,000	8,750 CW and WW	22,000 (1976)
Bostwick Park (Silver Jack)	2 (C) CW		500			19 (G) CW	Improved minimum flows and improved water quality	4,300	300 CW	3,600 (1976)
Dallas Creek (Ridgway)	5 (P) CW		450			12 (G) CW	Same as above	6,000	No fishery planned ^{6/}	
Total within basin										
No fishery	4	1				190				
Warm water fishery	310	95				285				
Cold water fishery	90	43								
Total	404	139	79,940		111,000	475		113,000	263,880	1,240,500
Outside of basin										
Bonneville Unit	12 (E-G) CW		6,600	Reduced flows	47,800	25 (E) CW	Improved flows	27,300	8,400 CW and WW	^{7/} 197,900
San Juan-Chama	8 (O)		None			12 (C) CW	Improved minimum flows	1,000	5,900 CW	7,300 (1976)
Total outside of basin	20		6,600		47,800	37		28,300	14,300	205,200
Total changes in and outside of basin	424	139	86,540		158,800	512		141,300	278,180	1,445,700

^{1/} Table shows total effects of CRSP, both within and outside of the Colorado River Basin, but the accompanying narrative only describes impacts of these effects within Upper Colorado River Basin since the base data necessary to make an impacts analysis for areas outside the basin have not yet been accumulated.

^{2/} Quality factors given as E-excellent, G-good, F-fair, P-poor, and O-no sport fishery; CW denotes a cold water fishery and WW a warm water fishery.

^{3/} Quality of the fishery is not given as it may vary with the age of the impoundment and the type and degree of management applied by the managing agency.

^{4/} Consists of the following reservoirs--enlargement of Strawberry Reservoir and construction of Bottle Hollow, Starvation, Currant Creek, Lower Stillwater, Upper Stillwater, Hayes, Mona, Jordanelle, Diamond Fork, and Lampton Reservoirs.

^{5/} Combination of Fish and Wildlife Service 1965 estimates and Bureau of Reclamation 1976 estimates.

^{6/} A reservoir with an estimated surface area of 1,000 acres would be constructed but present plans do not call for stocking or management of the reservoir as a fishery. If public pressure forced stocking, however, an estimated 24,400 man days of fishing use would occur.

^{7/} Fishing use estimates by the Fish and Wildlife Service (1965).

and Hotchkiss Hatchery in Colorado produced 3.3 million. These hatcheries are used to help stock CRSP reservoirs and segments of improved streams. Specific fishery lakes have been constructed or stabilized in association with the Curecanti, Bonneville, and Emery County Projects, and post-impoundment studies have been funded to provide management data for project streams and reservoirs.

(b) Developments Scheduled for 1977 Construction Starts

The five projects scheduled for construction starts in 1977 would cause an estimated 0.1 percent decrease in the miles of cold water stream fishery in the Upper Colorado River Basin and an estimated 2.3 percent decrease in the miles of warm water stream fishery. Overall, these changes would decrease the miles of stream fishery in the Upper Colorado River Basin by about 34 miles (less than 0.4 percent). The effects of the stream fishery are summarized in the following table.

Table C-25

Summary of effect on stream fisheries in Upper Colorado River Basin of developments scheduled for 1977 construction starts

Type of fishery	Stream miles						Changes ^{2/} (per-cent)
	1976 modified base	Inun-dated	Changed warm to cold water ^{1/}	De-graded	Im-proved	Remain-ing con-ditions ^{2/}	
Cold water	7,793	18	+11	12	70	7,787	-.1
Warm water	1,194	16	-11		48	1,176	-2.3

1/ Changed as a result of storage regulation.

2/ Does not include degraded or improved stream miles.

Table C-26 gives a project-by-project description of the streams to be impacted and shows that of the 34 miles of stream to be inundated only about 14 miles can be classified as good small stream trout habitat with the remaining miles classified as generally poor cold or warm water fisheries. The table also shows that, of the 12 miles of cold water stream to be degraded because of reduced flows, 11 miles are classified as good small stream trout habitat.

The tradeoffs for the streams lost and degraded are the creation and improvement of reservoir fisheries with a total surface area of about 7,600 acres and the improvement of 70 miles of cold water stream fishery and 48 miles of warm water stream fishery. Although the Grand Valley and Paradox Valley Units would improve the downstream water quality, no significant change in the related warm water fisheries is expected. It is estimated the five projects would result in a net increase of approximately 169,800 man days of fishing annually for warm and cold water species of fish.

(2) Endangered Fish Species

(a) CRSP Developments Constructed or Under Construction

Four endemic species of fish unique to the Colorado River and its larger tributaries (generally the downstream portions of the Green, Yampa, Gunnison and San Juan Rivers) are of particular concern in evaluating impacts of the Colorado River Storage Project. These four species are the Colorado squawfish, the humpback and bonytail chub, and the humpback sucker. Because of a decline in habitat range and population numbers, the U.S. Fish and Wildlife Service has classified the Colorado squawfish and humpback chub as endangered species, and a number of Colorado Basin States have classified the humpback sucker and the bonytail chub as endangered and/or threatened.

The four species mentioned are all large river fishes. They evolved in the natural river and its larger tributaries historically when the environment of the river was extremely harsh and characterized by warm water, radical flow fluctuations, heavy silt load, areas of extreme turbulence, and high dissolved solid concentrations. The populations have declined drastically, however, with the changes in aquatic habitat caused by man's activities. The decline is attributable to such activities as construction of large river impoundments, dumping of wastes and pollution in the river systems, introduction of exotic species of game and nongame fish, and other physical and chemical alterations in the system.

The Fish and Wildlife Service under the Endangered Species Act of December 28, 1973 (P. L. 93-205) is in the process of proposing that approximately 620 miles of the Colorado River and main-stem tributaries be designated as critical habitat for the Colorado River squawfish. The river areas to be affected by this proposal are the main Colorado River from Lake Powell to Grand Junction, Colo., the Green River from the confluence to the junction with the Yampa, the Yampa River upstream for about 90 miles, and a short section of the Gunnison River upstream from the junction of the Colorado River.

Within the lower Colorado River Basin, that area downstream of Glen Canyon Dam, the species are now either rare or non-existent.^{1/} The basic reason most often cited for their decline is the construction and operation of approximately 15 impoundments which control the lower river and have significantly altered the river habitat. In the Upper Basin it can be estimated that prior to the CRSP there were approximately 1,350 miles of habitat occupied by the Colorado River squawfish and the humpback chub. The CRSP has inundated 364 miles and changed the river conditions in another 170 miles of stream habitat below mainstream impoundments to eliminate a total of 534 miles of endangered fish habitat.

^{1/} Holden, Paul B. and Stalnaker, Clair B. "Distribution and Abundance of Mainstream Fishes of the Middle and Upper Colorado River Basins," 1967-73, Transactions of the American Fisheries Society, April 1975.

Project	n for ement	shery improved Increase in use (fisher- man days)	Flatwater fishery created or improved	
			Acres and type of fishery ^{1/}	Estimated use (fisher- man days)
Savery-Pot Hook				
Sandstone Reservoir	flows and t minimums	400	382 CW	1,300
Pot Hook Reservoir	cess	350	1,037 CW	5,000
Fruitland Mesa				
Milly K. Goodwin	flows and	1,000	606 CW	7,000
Gould Reservoir ^{2/}			328 CW, WW	4,000
Dolores				
McPhee Reservoir	flows and	10,000 28,000	4,470 CW	52,000
Monument Creek Res			84 WW	1,500
Dawson Draw Reservoir			294 CW	35,000
Groundhog Reservoir	flows	8,000	400 CW ^{3/}	17,600
Grand Valley			None	None
Paradox ^{4/}	lity	No estimate available	None ^{4/}	None
Summary				
Warm water fishery		28,000		
Cold water fishery		19,750		
Total		47,750	7,601	123,400

^{1/} Quality fact fishery.

^{2/} An existing

^{3/} An existing

^{4/} Includes an

(2) Endangered Fish Species

(a) CRSP Developments Constructed or Under Construction

Four endemic species of fish unique to the Colorado River and its larger tributaries (generally the downstream portions of the Green, Yampa, Gunnison and San Juan Rivers) are of particular concern in evaluating impacts of the Colorado River Storage Project. These four species are the Colorado squawfish, the humpback and bonytail chub, and the humpback sucker. Because of a decline in habitat range and population numbers, the U.S. Fish and Wildlife Service has classified the Colorado squawfish and humpback chub as endangered species, and a number of Colorado Basin States have classified the humpback sucker and the bonytail chub as endangered and/or threatened.

The four species mentioned are all large river fishes. They evolved in the natural river and its larger tributaries historically when the environment of the river was extremely harsh and characterized by warm water, radical flow fluctuations, heavy silt load, areas of extreme turbulence, and high dissolved solid concentrations. The populations have declined drastically, however, with the changes in aquatic habitat caused by man's activities. The decline is attributable to such activities as construction of large river impoundments, dumping of wastes and pollution in the river systems, introduction of exotic species of game and nongame fish, and other physical and chemical alterations in the system.

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Within the lower Colorado River Basin, that area downstream of Glen Canyon Dam, the species are now either rare or nonexistent.^{1/} The basic reason most often cited for their decline is the construction and operation of approximately 15 impoundments which control the lower river and have significantly altered the river habitat. In the Upper Basin it can be estimated that prior to the CRSP there were approximately 1,350 miles of habitat occupied by the Colorado River squawfish and the humpback chub. The CRSP has inundated 364 miles and changed the river conditions in another 170 miles of stream habitat below mainstream impoundments to eliminate a total of 534 miles of endangered fish habitat.

^{1/} Holden, Paul B. and Stalnaker, Clair B. "Distribution and Abundance of Mainstream Fishes of the Middle and Upper Colorado River Basins," 1967-73, Transactions of the American Fisheries Society, April 1975.

Table C-26
Fishery data for CRSP developments scheduled for construction in 1977

Project	Streams degraded					Stream sport fishery improved			Flatwater fishery created or improved	
	Streams inundated		Length (miles), quality, and type of fishery ^{1/}	Reason for change	Loss of use (fisherman days)	Length (miles), quality, and type of fishery ^{1/}	Reason for improvement	Increase in use (fisherman days)	Acres	Estimated use
	Length (miles), quality, and type of fishery ^{1/}								and type	(fisherman days)
	Mainstem	Tributaries							Loss of use (fisherman days)	of fishery ^{1/}
Savery-Pot Hook Sandstone Reservoir	4.2 (G) CW	2.5 (P) CW	200			11 (G) CW	Regulated flows and constant minimums	400	382 CW	1,300
Pot Hook Reservoir	5.4 (G) CW		250	Reduced flows	50	7 (G) CW	Public access	350	1,037 CW	5,000
Fruitland Mesa Milly K. Goodwin Lake	3.5 (G) CW	1 (G) CW	200	Reduced flows	600	8 (G) CW	Adequate flows and access	1,000	606 CW	7,000
Gould Reservoir ^{2/}									328 CW,WW	4,000
Dolores McPhee Reservoir	10 (P) WW	6 (P) WW	Insignificant			11 (G) CW 45 (G-F) WW	Improved flows and access	10,000 28,000	4,470 CW	52,000
Monument Creek Reservoir			None						84 WW	1,500
Dawson Draw Reservoir	1.5 (P) CW		Insignificant						294 CW	35,000
Groundhog Reservoir ^{3/}						33 (G) CW	Improved flows	8,000	400 CW ^{3/}	17,600
Grand Valley			None						None	None
Paradox ^{4/}			None	None	None	3 (F) WW	Water quality	No estimate available	None ^{4/}	None
Summary										
Warm water fishery	10	6				70		28,000		
Cold water fishery	14.6	3.5	650		650	48		19,750		
Total	24.6	9.5	650		650	118		47,750	7,601	123,400

^{1/} Quality factors given as E-excellent, G-good, F-fair, P-poor, and O-no sport fishery; CW denotes a cold water fishery and WW denotes a warm water fishery.

^{2/} An existing reservoir to be improved with provision of minimum pool.

^{3/} An existing reservoir to be improved through stabilization.

^{4/} Includes an offstream, 3,600-acre evaporation pond that would have no value for aquatic life.

Glen Canyon Dam inundated 186 miles of habitat for the endangered species in the Colorado River and 71 miles in the San Juan River. In addition, it altered flow and water quality downstream many miles, including the Marble and Grand Canyon areas in the lower basin which were once considered significant habitat for the native fish species.

Construction of Flaming Gorge Dam resulted in the elimination of 72 miles of Green River habitat by inundation and the alteration of 65 miles of native fish habitat downstream of the dam. Prior to closing Flaming Gorge Dam the U.S. Fish and Wildlife Service conducted a fish eradication program in the reservoir basin and in the tributary area downstream to Dinosaur National Monument which eliminated many of the native fishes in this section of the Green River. However, this operation did not kill all of the fish nor did it permanently alter the river habitat.

Navajo Dam inundated 35 miles of San Juan River inhabited by the native Colorado River fish species. It also altered water quality downstream for approximately another 40 miles.

The Curecanti Unit dams have not directly affected any of the original habitat of the four large river species. However, the associated changes in flow regime and temperature in the 50-mile stretch of the Gunnison River between Delta and Grand Junction, Colo., have probably contributed to the decline of some species and the elimination of others.^{1/}

The losses of habitat from the large reservoir impoundments in the Upper Basin are summarized below.

Table C-27
Loss of river habitat for endangered fish species
in Upper Colorado River system--CRSP
developments constructed or under construction
(Unit--miles)

	Eliminated by inun- dation	Loss due to water qual- ity change	Total
Glen Canyon			
Colorado River	186	^{1/} 15	201
San Juan River	71		71
Flaming Gorge (Green River)	72	65	137
Navajo (San Juan River)	35	40	75
Curecanti (Gunnison River)		50	50
Total	364	170	534

^{1/} Also altered habitat in Lower Basin.

^{1/} Kidd, George, An Investigation of Endangered and Threatened Fish Species in the Upper Colorado River as Related to Bureau of Reclamation Projects, Unpublished Consultant's Report for Bureau of Reclamation, January 1977.

Unlike the large storage units discussed above, the smaller participating projects constructed or under construction have not eliminated habitat of the Colorado River endangered fish species. The projects in total, however, reduce the flows in the mainstem, change water quality, and therefore may indirectly have an adverse effect on the endangered fish species. The degree to which the projects may adversely affect the endangered species and their habitat is very difficult to estimate because the environmental parameters for life support and reproduction of these species are not known.

(b) Projects Scheduled for Construction Starts in 1977

Development of the five projects in the Upper Colorado River Basin planned for 1977 would not directly affect any known populations of the four endangered species by inundation of habitat or by discharge of tailwaters into inhabited areas. The fish stocked in project reservoirs and streams would not be expected to travel the substantial distance necessary for them to compete with the endangered fish populations. As the table below shows, the Grand Valley Salinity Control Unit is the only development located near endangered fish habitat. That unit, however, does not entail storage or any major features which would alter fish habitat in the Colorado River, nor is a fish stocking program planned in association with this project.

Table C-28
Major project features in relation to
endangered fish species habitat

Project	Feature	Approximate distance to and location of known endangered fish population	
Savery-Pot Hook	Sandstone	Yampa River at	
	Reservoir	confluence with	99 miles
	Pot Hook	Little Snake	
	Reservoir		120 miles
Fruitland Mesa	Milly K. Goodwin	Colorado River at	
	Reservoir	mouth of Gunnison	110 miles
Dolores	McPhee Reservoir	Colorado River at	
		mouth of Dolores	180 miles
Grand Valley	Drains into the		
	Colorado River		0 miles
Paradox	Brine well field	Colorado River at	
		mouth of Dolores	75 miles

Although finite tolerances of the endangered fishes for temperature, turbidity, salinity, and flow changes have not been determined, the Bureau of Reclamation does not believe the species would be significantly impacted by the small changes which have been predicted for these environmental factors for the following reasons.

The three projects with on-stream storage reservoirs, Savery-Pot Hook, Fruitland Mesa, and Dolores, would change temperatures in flows immediately below the reservoirs. By the time the flows reached

areas known to be inhabited by endangered fish species, however, they would have equilibrated with the average air and soil temperatures. Thus water temperatures of endangered fish habitat would not be influenced.

It is anticipated that turbidity levels in streams immediately downstream of project reservoirs and agricultural lands would be slightly decreased during spring runoff as a result of sediment deposition in the reservoirs and slightly increased during the summer as a result of project return flows. The changes would be indiscernible by the time flows from the project areas reached known endangered fish habitat because of natural interchanges of sediment pickup and deposition in intervening stream channels.

The salinity changes that would result from the five projects are not expected to affect any of the endangered species for all have been recorded as living in areas with extensive variations in salinity levels. Salinity levels as far downstream as Lees Ferry are projected to average less than 800 mg/l after construction of the five projects. At the Colorado-Utah border in 1974, salinity levels in the Colorado River ranged from 339 mg/l to 1,300 mg/l with no apparent adverse effects on the endangered species in that area. The Colorado squawfish and humpback sucker have also been successfully reared from egg stage to lengths of 10 to 12 inches at Willow Beach National Fish Hatchery in water with salinity levels greater than 800 mg/l.^{1/}

In combination, the five projects would reduce historic peak flows and slightly increase historic low flows in known habitat areas of endangered fish species. Because post-project flows would be within the range of historic flow fluctuations in these areas, however, it is not thought the flow changes would affect known endangered fish habitat. Exact numerical values for the flow changes are not given because the probability of error in measurement is substantially greater than the changes themselves would be.

d. Terrestrial Wildlife

(1) Developments Constructed or Under Construction

Because of the many variables involved and the limited data available on wildlife populations, no attempt has been made to estimate changes in terrestrial wildlife populations caused by CRSP developments constructed or under construction. Indications of the effects on the wildlife, however, can be gained from study of changes in habitat. In this analysis, five broad types of habitat--(1) riparian, (2) aspen-conifer, (3) shrub, brush, pinon-juniper, (4) grass land, and (5) crop land-pasture--have been considered as key habitat or habitat essential to the preservation of a species, with the emphasized species being game species such as mule deer, elk, moose, bighorn sheep, antelope, sage grouse, turkey, and waterfowl. Of the area in the upper basin in these types, a total of about 42 million acres is considered key habitat.^{2/}

^{1/} Willow Beach National Fish Hatchery, "Quality of Supply Water for Raceway at Willow Beach Hatchery." 1976.

^{2/} Key habitat description and estimated acreage have been developed from Upper Colorado River Basin Frame Work Study, Appendix XIII: Fish and Wildlife Resources, 1971.

CRSP reservoir and irrigation developments constructed or under construction reduce this habitat by about 367,800 acres or about 1 percent. In addition to changes in the Upper Basin, changes occur on about 70,000 acres of land in the Bonneville Basin and Rio Grande Basin as a result of CRSP developments. All of the habitat changes are not a total loss to wildlife since most key habitat has been converted to reservoirs and irrigated crop land which have value to a variety of waterfowl, small game, and nongame species. Although the changes in the basin appear small in relation to the total habitat, they have significant impacts in local areas of individual projects and are one of the many man-caused factors placing pressure on wildlife in the basin. A summary of the habitat changes is given in Table C-29.

In addition to the habitat changes tabulated, adverse impacts on wildlife result from construction of such facilities as canals, powerlines, recreation areas, and access roads. Then, too, some reservoirs, such as Flaming Gorge, have indirectly impacted key habitat by interfering with historic big game migration routes. Irrigation projects have also probably adversely affected wildlife by necessitating localized control measures because of crop depredation problems on newly irrigated crop land. On the other hand, livestock grazing has been controlled within rights-of-way for some reservoirs to the benefit of wildlife.

Losses of riparian-phreatophytic shrub habitat, amounting to about 8,700 acres, are especially significant to local project areas because of the relative scarcity of such vegetation and its importance to a diversity of species. Mule deer and, to a lesser extent, elk use these areas for food and cover. Other wildlife groups which are more dependent on this vegetative type and which have been adversely impacted by its loss are furbearers, nongame birds, small mammals, and birds of prey. At Glen Canyon, for example, the narrow band of riparian habitat inundated probably represented the most critical habitat in this desert environment and should be recognized as a locally significant loss.

The losses of approximately 2,000 acres of aspen-coniferous forest habitat have probably not been significant because of the small acreages involved with individual projects. Such lands, however, are important to deer and elk for food, cover, and fawning and calving areas.

Some of the most significant impacts would be related to the loss of approximately 199,000 acres of brush lands and pinon-juniper wood lands in the basin. In much of the basin these areas are winter range for deer and elk. Some of these areas also provide key habitat for antelope and sage grouse. Cottontail rabbits and numerous nongame species also utilize this habitat. In terms of key habitat available, this acreage loss does not appear significant basin wide, but this habitat type often includes crucial areas for individual herds or groups of animals.

Most of the grass land lost, approximately 153,000 acres, was in Glen Canyon. Much of this land would be considered desert and would not represent key wildlife habitat. It had a low density of vegetation including Indian rice grass and galleta and desert shrubs which provided little food and cover for wildlife.

under construction

ad-pasture	Flat water	Specific wildlife develop- ments
20,700	80,700	Not determined
<u>s</u> <u>Gains</u>	<u>Gains</u>	<u>Gains</u>
	9,180	
	42,000	5,520
	163,000	
	15,600	3,060
5,730	600	
2,230	300	
2,120	350	
1,420	400	
3,900		
	19,900	10,200
440	500	500
	800	600
770	1,400	2,030
	800	1,270
	8,750	22,000
100,000		
1,320	300	
	1,000	1,000
117,930	264,880	46,180

27,800	345,580	
3	328	
29,370	8,400	14,500
5,730	5,905	8,000
35,100	14,305	22,500
153,030	279,185	68,680

a) adjusted to reflect habitat

ts were estimated on the basis of
where habitat figures were avail-
and southern desert shrub types.
irrigation.

CRSP reservoir and irrigation developments constructed or under construction reduce this habitat by about 367,800 acres or about 1 percent. In addition to changes in the Upper Basin, changes occur on about 70,000 acres of land in the Bonneville Basin and Rio Grande Basin as a result of CRSP developments. All of the habitat changes are not a total loss to wildlife since most key habitat has been converted to reservoirs and irrigated crop land which have value to a variety of waterfowl, small game, and nongame species. Although the changes in the basin appear small in relation to the total habitat, they have significant impacts in local areas of individual projects and are one of the many man-caused factors placing pressure on wildlife in the basin. A summary of the habitat changes is given in Table C-29.

In addition to the habitat changes tabulated, adverse impacts on wildlife result from construction of such facilities as canals, powerlines, recreation areas, and access roads. Then, too, some reservoirs, such as Flaming Gorge, have indirectly impacted key habitat by interfering with historic big game migration routes. Irrigation projects have also probably adversely affected wildlife by necessitating localized control measures because of crop depredation problems on newly irrigated crop land. On the other hand, livestock grazing has been controlled within rights-of-way for some reservoirs to the benefit of wildlife.

Losses of riparian-phreatophytic shrub habitat, amounting to about 8,700 acres, are especially significant to local project areas because of the relative scarcity of such vegetation and its importance to a diversity of species. Mule deer and, to a lesser extent, elk use these areas for food and cover. Other wildlife groups which are more dependent on this vegetative type and which have been adversely impacted by its loss are furbearers, nongame birds, small mammals, and birds of prey. At Glen Canyon, for example, the narrow band of riparian habitat inundated probably represented the most critical habitat in this desert environment and should be recognized as a locally significant loss.

The losses of approximately 2,000 acres of aspen-coniferous forest habitat have probably not been significant because of the small acreages involved with individual projects. Such lands, however, are important to deer and elk for food, cover, and fawning and calving areas.

Some of the most significant impacts would be related to the loss of approximately 199,000 acres of brush lands and pinon-juniper wood lands in the basin. In much of the basin these areas are winter range for deer and elk. Some of these areas also provide key habitat for antelope and sage grouse. Cottontail rabbits and numerous nongame species also utilize this habitat. In terms of key habitat available, this acreage loss does not appear significant basin wide, but this habitat type often includes crucial areas for individual herds or groups of animals.

Most of the grass land lost, approximately 153,000 acres, was in Glen Canyon. Much of this land would be considered desert and would not represent key wildlife habitat. It had a low density of vegetation including Indian rice grass and galleta and desert shrubs which provided little food and cover for wildlife.

Table C-29
Major terrestrial wildlife habitat changes--CRSP developments constructed or under construction
(Unit--acres)

	Riparian ^{2/}	Aspen- conifer	Shrub, brush, pinon- juniper ^{3/}	Grassland	Cropland-pasture	Flat water	Specific wildlife develop- ments
Key habitat in Upper Colorado River Basin without CRSP ^{1/}	200,000	6,648,900	29,987,300	1,064,700	3,720,700	80,700	Not determined
Changes in Upper Basin ^{4/}	Reductions			Reductions		Gains	Gains
Curecanti Unit	430	1,010	6,000	270	2,070	9,180	
Flaming Gorge Unit	1,730	800	34,970		940	42,000	5,520
Glen Canyon Unit	90		2,930	^{5/} 153,290		163,000	
Navajo Unit	150		12,190		4,000	15,600	3,060
Florida Project	10	100	5,930	300		5,730	600
Paonia Project	5		2,430	100		2,230	300
Silt Project	10	15	2,320		200	2,120	350
Smith Fork Project	10		1,590		130	1,420	400
Hammond Project			3,030			3,900	
Bonneville Unit	3,000		17,500	3,000	200	19,900	10,200
Jensen Unit	40		680	230	60	440	500
Vernal Unit			580		300	800	600
Emery County Project	10		2,160			770	2,030
Lyman Project	260		1,190	260		800	1,270
Seedskaadee Project	2,860		3,660		2,310	8,750	22,000
Navajo Indian Irriga- tion Project			100,000			100,000	
San Juan-Chama Project	5						
Bostwick Park Project		20	1,400	190		1,320	300
Dallas Creek Project	100		920		600	1,000	1,000
Total	8,710	1,945	199,480	157,640	10,810	117,930	264,880
Total remaining habitat in basin--1976 modified base (rounded)	191,300	6,647,000	29,788,900	907,100	3,827,800	345,580	
Percent change	4	0.03	0.7	17	3	328	
Changes outside of basin							
Bonneville Unit							
Bonneville Basin	25,000		12,000		29,370	8,400	14,500
San Juan-Chama Project							
Rio Grande Basin	5		31,810		5,730	5,905	8,000
Total	25,005		43,810		35,100	14,305	22,500
Total changes in and out- side of basin	33,715	1,945	243,290	157,640	153,030	279,185	68,680

1/ Derived from the 1971 Upper Colorado Region Comprehensive Framework Study (1965 data) adjusted to reflect habitat changes due to CRSP units constructed prior to 1965.

2/ Data on quantity of riparian habitat are scarce. Habitat losses due to CRSP projects were estimated on the basis of miles of stream inundated, with the exception of Flaming Gorge, Curecanti, and Glen Canyon where habitat figures were available from pre-impoundment studies.

3/ Includes pinon-juniper wood land, mountain brush, salt desert shrub, and northern and southern desert shrub types.

4/ Figures shown are estimates for land either inundated or placed under full service irrigation.

5/ Generally not considered key habitat.

CRSP has increased irrigated croplands and pasture by about 107,000 acres. These lands and small patches of weeds, fence rows, and "waste" areas associated with them provide important feeding area during certain times of the year for game species such as rabbits, pheasants, doves, quail, and waterfowl. Small mammals, nongame birds, and raptors also use such habitat extensively.

CRSP developments constructed or under construction increase the surface areas of flat water in the Upper Basin by more than 300 percent. This habitat is of value to wildlife, particularly waterfowl and shorebirds.

Some losses of habitat, for instance riparian habitat, are difficult, if not impossible, to mitigate. Wildlife mitigation and enhancement programs, however, are being undertaken to offset other wildlife habitat losses incurred by the projects. For example, one wildlife refuge and four waterfowl areas are being developed to replace losses or enhance waterfowl habitat. These include the Seedskadee National Wildlife Refuge in Wyoming and the Brown's Park Waterfowl Management Area in Utah, both along the Green River; Miller Mesa Waterfowl Area on the west shore of Navajo Reservoir in New Mexico; and the Desert Lake Waterfowl Management Area in eastern Utah. Stewart Lake Waterfowl Management Area in eastern Utah is being improved in connection with the Vernal and Jensen Units, and planning is underway to mitigate waterfowl losses on the Uintah-Ouray Indian Reservation by construction of waterfowl habitat areas along the Duchesne River in eastern Utah.

Big game range improvements designed to increase the carrying capacity of existing range to replace habitat losses incurred by CRSP developments are being made in association with the Flaming Gorge Unit, Emery County and San Juan Projects, and the Jensen and Bonneville Units of the Central Utah Project. Additional purchases are being planned in the Bonneville Unit and Lyman and Dallas Creek Projects to mitigate big game range losses. Adequate measures to mitigate habitat losses associated with the Curecanti Unit have not been accomplished to date. However, updated recommendations have recently been received from the Colorado Division of Wildlife, and the Bureau plans to actively pursue the recommended measures.

(2) Developments Scheduled for Construction Starts in 1977

The five projects scheduled for construction starts in 1977 result in an estimated direct reduction of about 45,000 acres of wildlife habitat as shown in Table C-30. Most of this habitat would be considered key habitat. This loss represents a small portion of the total key habitat available in the basin but is significant to some local areas. The ranges for big game associated with the Savery-Pot Hook, Dolores, and Fruitland Mesa Projects are crucial areas for individual herds. Because of the importance of these lands to game species, the same types of lands are planned for acquisition and initial development to mitigate potential wildlife losses. The acquired lands should substantially offset potential wildlife losses with the possible exception of projected sage grouse losses associated with the Savery-Pot Hook Project. Although large acreages of predominantly sagebrush habitat are to be acquired and improved specifically for antelope and sage grouse,

Table C-30
Major terrestrial wildlife habitat changes--1977 construction starts
(Unit--acres)

Time frame	Riparian	Aspen- conifer	Shrub, brush, and pinon- juniper	Grass land	Crop land pasture	Specific wildlife	
						Flatwater developments	Habitat gains
Total habitat in 1976 modified base conditions	191,300	6,647,000	29,788,900	907,100	3,827,800	345,600	46,180
Habitat changes with projects scheduled for 1977 construction starts	Habitat reductions					Reductions	Gains
	200	100	14,800			500	14,400
	100	100	13,000	100		200	11,900
	500		2,500	8,800		2,600	7,500
	1,000						
	900		2,500				
	2,700	200	32,800	8,900	30,500	7,600	30,200
	188,600	6,646,800	29,756,100	898,200	3,797,300	273,200	76,380
	1.4	0.01	0.1	0.9	0.8	2.2	
							1/1/
Total							
Remaining habitat							
Percent change							

1/ A fish and wildlife plan has not been completed at this time.

the effectiveness of this action in maintaining present sage grouse populations in the Savery-Pot Hook area cannot be predicted since the improvement of range for sage grouse is not a well developed science. In the long-term, however, this management unit should be beneficial to the overall population in Moffat County since the lands represent a long-term commitment to the continuation and study of this species. Moreover, as biological knowledge concerning the requirements for the continued existence of this species in Colorado grows, this knowledge would be applied as a management technique on the mitigation lands.

e. Availability of Water

(1) CRSP Developments Constructed or Under Construction

The amount of water in the Colorado River available for consumptive use in the Upper Basin has been conservatively estimated by the Secretary of the Interior at an average of 5,800,000 acre-feet annually. This estimate is based on provisions of the Colorado River Compact of 1922 and the Upper Colorado Basin Compact of 1948 and is based on the assumption that the Upper Basin would be obligated to meet one-half (750,000 acre-feet annually) of the commitment of the Mexican Water Treaty of 1944. The estimate also takes into consideration, among other factors, the capability of existing regulatory storage in the Upper Colorado River system to meet compact commitments to the Lower Basin.

Of the average of 5,800,000 acre-feet annually estimated to be available to the Upper Basin, approximately 4,591,000 acre-feet is committed to developments constructed or under construction. Of these commitments, 1,214,000 acre-feet or 26 percent is committed to units and participating projects of the Colorado River Storage Project. Depletions by States are shown in Table 31. Depletions from individual projects are shown in Table C-33.

Table C-31
Stream depletions of CRSP developments
constructed or under construction compared with
estimated entitlements and 1976 modified conditions
(Unit--1,000 acre-feet)

	Colorado	Wyoming	Utah	New Mexico	Arizona	Total
Estimated entitlement	2,976	805	1,322	647	50	5,800
Actual depletions to 1976 ^{1/}	2,097	409	835	332	25	3,698
Additional depletions from projects under construction	295	120	165	291	22	893
Total depletions to 1976 modified base	2,392	529	1,000	623	47	4,591
CRSP depletions	339	109	336	430		1,214
Percent of CRSP depletion to total depletion	14	21	34	69		26

^{1/} Includes evaporation from storage reservoirs.

(2) Developments Scheduled for 1977 Construction Starts

Estimated depletions for the five projects scheduled for construction starts in 1977 amount to a total of 128,600 acre-feet annually, including 118,100 acre-feet for the State of Colorado and 10,500 acre-feet for the State of Wyoming. These depletions are shown below in comparison with the estimated entitlements and estimated 1976 depletions for these States and the Upper Basin as a whole.

Table C-32
Stream depletions of developments scheduled for 1977 construction starts compared with estimated entitlement and 1976 modified conditions
(Unit--acre-feet)

	Colorado	Wyoming	Total Upper Basin
Estimated entitlement	2,976,000	805,000	5,800,000
Total depletions in 1976 modified base	2,392,000	529,000	4,591,000
Depletions from projects scheduled for 1977 starts			
Savery-Pot Hook Project	11,900	10,500	22,400
Dolores Project	80,900		80,900
Fruitland Mesa Project	21,300		21,300
Grand Valley Unit	0		0
Paradox Valley Unit	4,000		4,000
Subtotal	118,100	10,500	128,600
Remainder of estimated entitlement	465,900	265,500	1,080,400

f. Salinity

(1) CRSP Developments Constructed or Under Construction

The salinity level of the Colorado River at Imperial Dam under 1976 modified base conditions, including effects of CRSP developments constructed or under construction, is estimated at 1,102 mg/l. This reflects the effects of many variable factors. It includes the salt concentration in the river even before man's activities were begun and, of course, also includes the results of man's activities, including storage regulation, diversions for use within and outside of the basin, evaporation, and return flows. Because of the many variable factors involved, it is extremely difficult to determine the effects on salinity from any particular development. Nevertheless it has been estimated that of the 1,102 mg/l salinity level in the modified base, approximately 147 mg/l or 13 percent could be attributable to the units and participating projects of the Colorado River Storage Project included in the base. Of the total 147 mg/l contribution, 128 mg/l would be attributable to concentrating effects of stream depletions and 19 mg/l to the salt loads contributed. Except in cases where special studies have been made to determine specific loading from a project, it has been assumed that irrigation would increase the salt load from new lands by 2 tons an acre but would result in no additional salt load from supplemental

service lands. The depletions and salt loads from each development are shown in Table C-33.

(2) Developments Scheduled for 1977 Construction Starts

Estimates have been made of salinity impacts on the 1976 modified base that could be expected with the five developments in the Upper Colorado River Basin scheduled for construction starts in 1977 pending compliance with the National Environmental Policy Act. Table C-34 shows the estimated salinity impacts of the developments at Imperial Dam, while Table C-35 shows the developments' effects on the Colorado River system at points above Imperial Dam. Table C-34 also shows estimates of economic externalities of the salinity effects. These externalities have been based on a rate of \$230,000 for each mg/l of salinity increase at Imperial Dam. This rate has been estimated by the Bureau of Reclamation and takes into account reduced productivity and increased agricultural production costs that downstream water users might experience from the salinity impacts. It also takes into account increased costs that might be necessary for treatment of municipal and industrial water as a result of salinity increases and the reduced life of water pipes and other facilities that would result from the increases in concentration.

(3) Overview of Colorado River

Estimates of future salinity levels in the Colorado River are highly speculative. Various entities have made projections in the past and have arrived at differing estimates because of different base conditions assumed with respect to quantity of runoff, rate of development, and implementation of salinity control measures. In order to provide some early perspective of projected salinity levels in the river, however, this section includes a discussion of Bureau of Reclamation estimates and the results of one of several analyses made by the Colorado River Basin Salinity Control Forum.

In its study the Bureau of Reclamation analyzed effects of 45 water resource development projects and 17 salinity control measures. The water resource projects are listed in the Department of the Interior's Progress Report No. 8, Quality of Water, Colorado River Basin, and include authorized Federal developments as well as State, local, and private developments. Thirty-five of the water resource developments and 12 of the salinity control measures would be in the Upper Basin and 10 of the water resource developments and 5 of the salinity control measures in the Lower Basin. The salinity control measures are planned to provide control of point, diffuse, and irrigation sources of salinity. Under the Colorado River Salinity Control Act of June 24, 1974, 4 salinity projects were authorized for construction and 12 authorized for further study. The seventeenth unit, the Meeker Dome Unit in Colorado, is now also under investigation. All are discussed in the Final Environmental Statement, Water Quality Improvement Program, co-authored by the Bureau of Reclamation and Soil Conservation Service, which is scheduled for completion early in 1977.

Table C-33
Estimated depletions and salt loads
CRSP developments constructed or under construction

Projects	Depletions (1,000 acre-feet)	Salt loads ^{1/} (1,000 tons)	Total
Storage units			
Curecanti	10		
Flaming Gorge	50		
Glen Canyon	460		
Navajo	26		
Participating projects			
Florida	14	11	
Paonia	10		
Silt	6	4	
Smith Fork	6	3	
Hammond	5	8	
Central Utah			
Bonneville	166	<u>1/-</u> 27	
Jensen	15	1	
Vernal	12		
Emery County	17	2	
Lyman	10		
Seedskadee	22		
Navajo Indian	254	220	
San Juan Chama	110	<u>1/-</u> 16	
Bostwick Park	4	3	
Dallas Creek	17	9	
Total	1,214	218	
Increase in concentration at Imperial Dam (mg/l)	128	19	147

^{1/} Negative amount due to transbasin diversion of salts.

Table C-34
Salinity impacts at Imperial Dam
of projects scheduled for 1977 construction starts

Project	Effects of concentration			Effects of salt loading			Total	
	Stream depletion (1,000 acre-feet)	Economic Effect on salinity (mg/l)	Externalities (\$1,000)	Change in salt load (tons)	Economic Effect on salinity (mg/l)	Externalities (\$1,000)	Total effects on salinity (mg/l)	economic externalities (\$1,000)
Participating projects of Colorado River Storage Project								
Fruitland Mesa	21.3	2.6	-\$598	10.9	1.1	-\$253	3.7	-\$851
Savery-Pot Hook	22.4	2.8	-644	11.8	1.2	-276	4.0	-920
Dolores	80.9	10.1	-2,323	10.0	1.0	-230	11.1	-2,553
Units of Colorado River Basin Salinity Control Project								
Grand Valley				-200.0	-20.7	4,761	-20.7	4,761
Paradox	3.6	.4	-92	-180.0	-18.6	4,278	-18.2	4,186

Table C-35
Salinity effects of projects scheduled for 1977
construction starts as related to base
conditions on Colorado River system
(Unit--mg/l)^{1/}

Stream and reference point	1976 modified base	Effects of five projects	Base with five projects
Green River near Green River, Utah ^{2/}	496	5	501
Colorado River at Lees Ferry, Ariz.	677	-18	659
Colorado River at Imperial Dam	1,102	-20	1,082

^{1/} Rounded to nearest unit.

^{2/} Salinity at this point is affected only by Savery-Pot Hook Project of the five projects being analyzed.

The Bureau of Reclamation estimates were made to the year 2000. They were based on hydrologic records for the period 1941-74 since this is the only period having extensive concurrent runoff and quality data. During this period the mean annual virgin runoff at Lees Ferry was approximately 13.9 million acre-feet. The corresponding depletion levels at Imperial Dam for the years 1990 and 2000 were projected to be 13.5 million acre-feet and 13.9 million acre-feet, respectively, part of which is supplied by inflows below Lees Ferry. As previously mentioned, unless a special analysis has been made to determine specific loading for a project, the Bureau of Reclamation assumed that irrigation would increase the salt load from new lands by 2 tons per acre but would result in no additional salt load from supplemental service lands.

Estimates of future salinity in the Colorado River were compared against a standard salinity level of 879 mg/l at Imperial Dam. This standard was proposed by the Colorado River Basin Salinity Control Forum and approved by the Environmental Protection Agency. Establishment of this standard was part of the salinity program in the Colorado River Basin which is being undertaken with the general objective of keeping salinity in the Lower Basin at or below present levels while the Basin States continue to develop their compact apportioned water.

Salinity projections of the Bureau of Reclamation are shown in Table C-36 and Figure C-4. As shown in the table, salinity control measures authorized and under study would provide a reduction of about 1.6 million tons of salt annually. This level represents a concentration reduction of about 171 mg/l at Imperial Dam in the year 2000, which only partially offsets the expected maximum total concentration of 1,214 mg/l. In order to attain the adopted salinity standard, additional control, augmentation, or management steps will be necessary. Thus weather modification, vegetation management, watershed improvement, additional desalting, and various nonstructural measures remain to be considered and studied in detail.

Table C-36
Summary of cumulative salinity impacts at year 2000
projected by Bureau of Reclamation
(average annual conditions)

	Total depletions (1,000 acre-feet)	Salt added (1,000 tons)	Salinity concentra- tion at Imperial Dam (mg/l)	Salt+ removal to maintain 879 mg/l (1,000 tons)
--	---	----------------------------------	--	---

	<u>Development level</u>			
Present modified (1974) ^{1/}	11,500		861	
Development projects ^{2/}	13,900	88	1,214	2,900

Salinity control measures

	Salt removed (1,000 tons)	Concentra- tion reduc- tion at Imperial Dam (mg/l)
Authorized (4 units)	429	48
Under investigation (13 units)	1,187	123
Total	1,616	171

^{1/} Present modified refers to historic conditions (1941-74)
modified to reflect all upstream existing projects for the full period.

^{2/} Present and projected.

Curve A on Figure C-4 shows the shape and magnitude of salinity effects of anticipated Colorado River Basin development from the 45 identified water resource development projects without any salinity control. Curve B shows salinity effects shown by Curve A accompanied by the timely construction of four authorized salinity control units. Curve C shows the cumulative effects of incorporating the 17 salinity control units authorized and under study. Curve D shows the additional measures needed to obtain the 1976 salinity standard.

The Colorado River Basin Salinity Control Forum analyzed an array of runoff and depletion levels in developing the salinity standards. The results of one of its analyses are plotted in Figure C-5. Curve a represents the salinity effects of the anticipated basin development without salinity control measures. Curve b represents the effect of adding the 4 authorized salinity control projects, 12 of the salinity control projects under investigation (Meeker Dome not included), and the adoption of a "no salt return" policy to industrial development. The Forum has concluded that the salinity standard can be maintained through 1990. Recognizing the inherent difficulty in projecting cumulative future impacts in the basin, a key provision allows for reassessment and review of salinity criteria every 3 years.

SALINITY AT IMPERIAL DAM PROJECTED BY BUREAU OF RECLAMATION

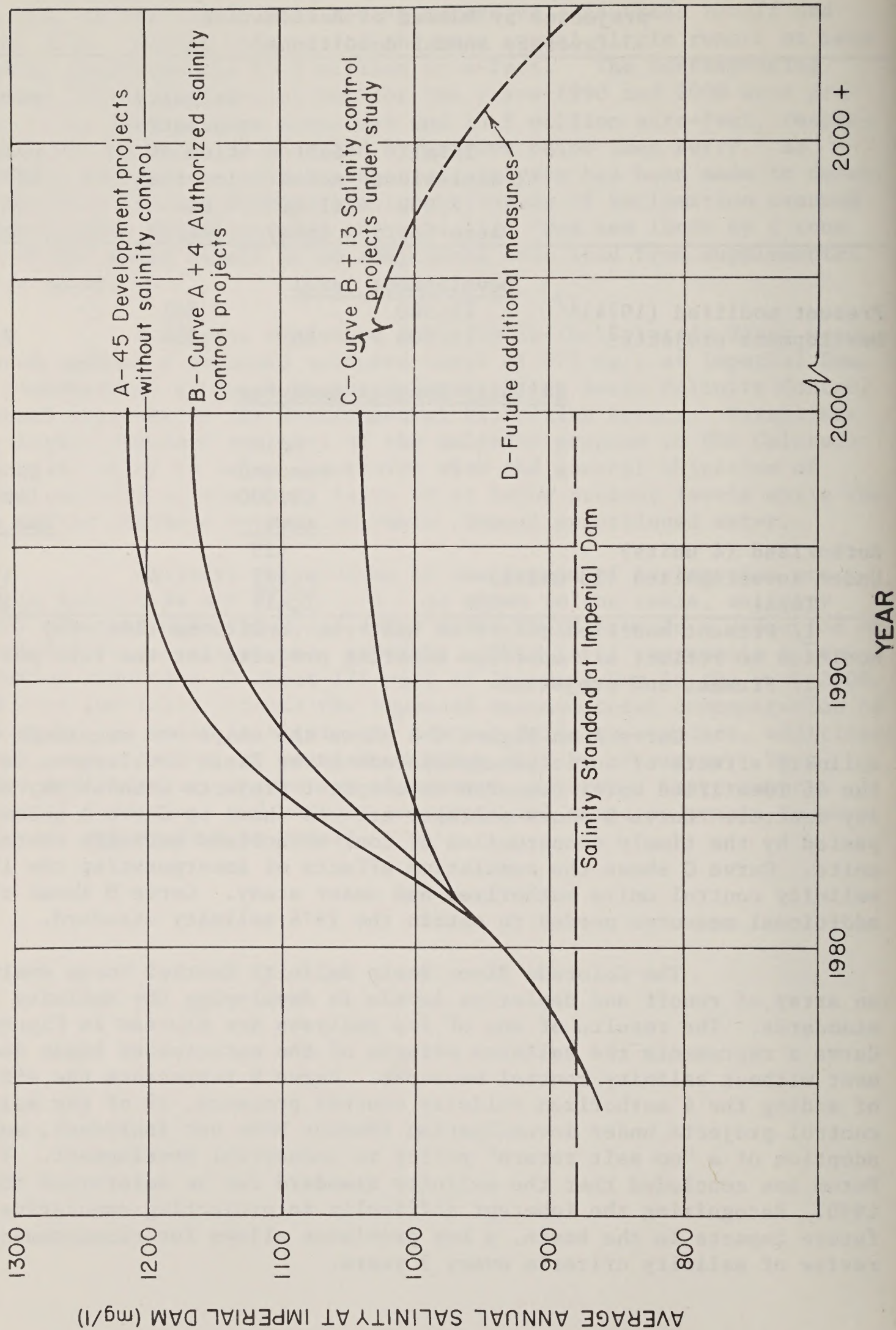


Figure C-4

SALINITY AT IMPERIAL DAM PROJECTED BY THE COLORADO RIVER BASIN SALINITY CONTROL FORUM

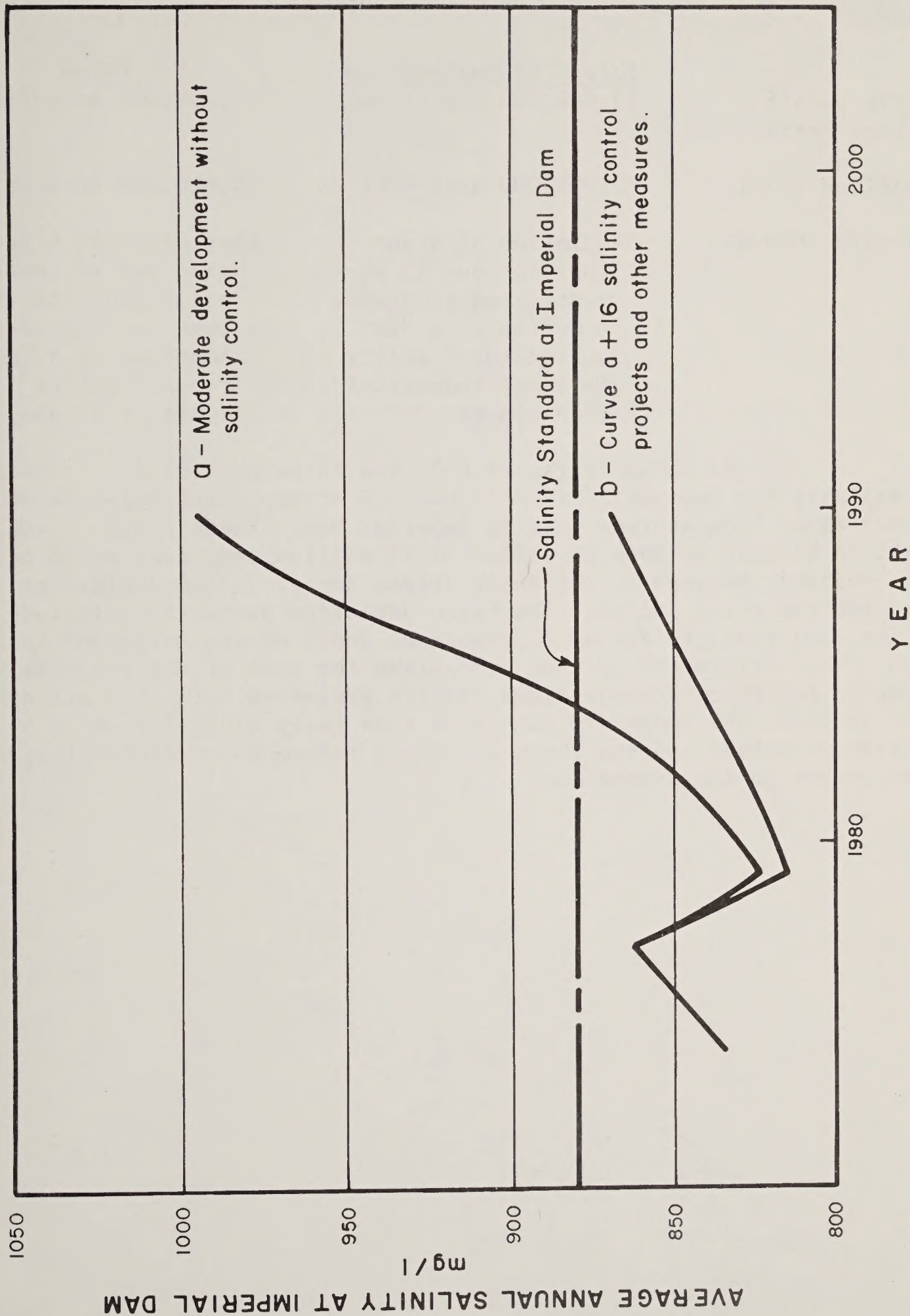


Figure C-5

The methods of analysis used by the Forum and the Bureau of Reclamation are similar. The input assumptions were different, however, and the resulting projected 1990 salinity levels are different. The following is a comparison of the assumptions that went into each study.

	<u>Bureau of Reclamation</u>	<u>Forum</u>
Virgin runoff (Lees Ferry)	13,900,000 acre-feet	15,000,000 acre-feet
Depletion level	13,500,000 acre-feet	12,600,000 acrefeet
Salinity control	Completion of 4 authorized and 13 investigated projects. Adoption of a "no salt return" policy to large industrial development.	Completion of 4 authorized and 12 investigated projects (Meeker Dome not included). Adoption of a "no salt return" policy to industrial development.

As shown in Figure C-5, the Forum projected a decrease in salinity for the period 1977-79 because of projected releases of excess flows from storage passing Imperial Dam. These releases would be required because an average inflow of 15 million acre-feet would occupy all available storage in the basin before the projected depletions equalled the total inflow. The Forum depletion projections include most of the same projects and developments as those of the Bureau of Reclamation. The anticipated date of completion for some of the projects is later in the Forum's projections and its projected total depletion by 1990 is less. The long-term runoff at Lees Ferry (1906-74) is 14.9 million acre-feet and the Forum adopted a future water yield closer to that number in its assessment.

CHAPTER D

MITIGATING MEASURES AND AIR AND WATER QUALITY ASPECTS

D. MITIGATING MEASURES AND AIR AND WATER QUALITY ASPECTS

1. General

This section presents the measures that would be carried out to protect the environment and mitigate adverse effects of the project. The Bureau of Reclamation would comply with the Clean Air Act, the Federal Water Quality Act, the Federal Water Pollution Control Act, the Fish and Wildlife Coordination Act, the Endangered Species Act, the Sikes Act, the Federal Land Management and Policy Act, the laws and executive orders regarding archaeological and historical resources, and other pertinent laws, procedures, and policies.

2. Measures to be Employed During Construction

Construction specifications would be written and construction activities monitored to protect the environment. Contractors would be required to comply with applicable Federal, State, and local laws, orders, and regulations concerning the prevention and control of air and water pollution and noise. Specifications would also require landscape preservation.

a. Air Quality and Noise Control

During construction, measures would be carried out to reduce dust and excessive exhaust pollution. Noise levels would be maintained below 75 decibels at night (8 p.m. to 7 a.m.) and 80 decibels during the day, measured outdoors at residences or other noise-sensitive areas.

b. Water Quality

Construction activities would be performed by methods that would prevent solid matter, debris, and other contaminants from entering streams, lakes, ground water, and other water courses. Such pollutants include refuse, garbage, concrete, sanitary wastes, and petroleum products. Turbidity would be controlled by the use of suitable sedimentation or settling ponds and flocculating agents where necessary. The water quality standards of the State of Colorado would be followed. The Bureau of Reclamation would obtain permits under the National Pollutant Discharge Elimination System and under Section 404 of the Federal Water Pollution Control Act. The contractor would be required to comply with stipulations governing the issuance of these permits to control the quality of wastewater discharges.

c. Landscape Preservation

Construction camps, shops, offices, and yards would be located and arranged in a manner to preserve soil and vegetation to the maximum extent practicable. At the reservoir sites, these areas would be located within the reservoir basins. Upon abandonment all materials and debris

would be removed from the sites, and the construction areas outside the reservoir basins would be reshaped and revegetated with native grasses and trees. The movements of crews and equipment would be restricted to established routes. If temporary roads were necessary, the alignments would be restored. Borrow and riprap areas would be excavated so as not to pond water. Before being abandoned, the sides would be brought to stable slopes and shaped to provide a natural appearance.

d. Other Considerations

If the use of pesticides were necessary, only those registered with the Environmental Protection Agency in compliance with the Federal Environmental Pesticide Control Act of 1972 would be used. Drilling and blasting would be done in compliance with applicable Federal, State, and local safety regulations. To avoid possible adverse effects of human activity on peregrine falcons possibly nesting southwest of Cortez, Colo., canal construction on the Towaoc Canal in this vicinity would be scheduled to avoid conflicts with courtship, incubation, and rearing of young (March-August).

3. Measures Incorporated in Project Design and Operation

a. Mitigation of Wildlife Losses

To fully compensate for the loss of wildlife habitat caused by reservoir inundation, 4,770 acres of private and public land at McPhee Reservoir would be acquired and maintained specifically as big game winter range. Stock fences along project canals would protect wildlife habitat within the rights-of-way from damage by livestock. An 8-foot-high fence installed along a concrete section of the Towaoc Canal in McElmo Canyon would prevent possible deer losses from drowning. Other canals would generally have side slopes that would allow wildlife to escape.

b. Salvage and Preservation of Archaeological and Historical Sites

The Bureau of Reclamation would comply with specific regulations designed to protect, preserve, restore, and maintain historical, archaeological, and anthropological resources on public land in the project area. These regulations are contained in the Reservoir Salvage Act of 1960, Presidential Executive Order 11593, the National Environmental Policy Act of 1969, the Historic Preservation Act of 1966, the Historic Sites Act of 1935, the Antiquities Act of 1906, and Section 8 of the Colorado River Storage Project Act of 1956. The Bureau of Reclamation, with a specific policy to mitigate adverse impacts on historical and archaeological resources, is proceeding with the following program:

- (a) Contracting with professional archaeologists to examine the project area and provide inventories of the resources

- (b) Evaluating the resources for significance and for eligibility for nomination to the National Register of Historic Places
- (c) Nominating to the register any properties deemed eligible
- (d) Seeking the advice of the President's Advisory Council on Historic Preservation whenever properties eligible for or already on the Register would be affected
- (e) Developing and carrying out specific mitigation programs in coordination with the State Historic Preservation Officer and the Advisory Council on Historic Preservation

After completing its archaeological survey, the University of Colorado recommended that an area be nominated to the National Register of Historic Places as an archaeological district. The nomination forms for significant sites are being prepared for submission to the State Historic Preservation Officer and the National Register of Historic Places.

As discussed in Chapter A, the Bureau has a proposed archaeological and historical program involving a survey of any areas not previously examined within the rights-of-way followed by an intensive excavation or test excavation of 135 sites, the stabilization of 2 petroglyphs, and surveillance of all the remaining sites while construction is underway. Intensive excavation would be designed to recover substantial data from a site. Test excavation would involve a limited testing of a site to determine if further investigation would be desirable. A more complete listing of the sites by cultural period, estimated project impact, and recommended mitigation is contained in Table C-5.

Should any previously unrecorded cultural resources such as additional archaeological sites, ranches and homesteads be located during future surveys or construction, they would be evaluated by an appropriate professional. A determination would be made in consultation with the State Historic Preservation Officer regarding the eligibility for nomination to the National Register of Historic Places and any eligible sites would be nominated for inclusion in the Register.

The University's survey identified 281 sites near project rights-of-way that would not be protected by Federal laws and regulations since they would continue to be on private property. The Bureau would encourage the landowners to preserve these sites in the future and would offer technical assistance. Archaeological sites on the Ute Mountain Ute Indian Reservation outside the project rights-of-way or on full service land would remain under the jurisdiction of the Ute Mountain Ute Tribe.

c. Control of Vectors

Various measures would be undertaken as part of project construction and operation for control of vectors. The normal summer

fluctuation zones of McPhee Reservoir would be completely cleared, except for isolated vegetation along abrupt shorelines that would be exposed to wave action or other places where mosquito production is not likely to occur. Low areas which could form pools at minimum water levels would be connected with the reservoir by channels to ensure drainage during low water levels. Drainage would also be provided for seeped and ponded areas behind dikes where significant mosquito production could occur. In order to ensure unrestricted drainage, vegetation, debris, and flotage would be periodically removed from the control drains.

d. White-Water Boating

Adverse effects on white-water boating below McPhee Reservoir would be mitigated by operation of the reservoir to allow the available boating flows to be scheduled in advance and grouped together in periods of 5 or more consecutive days. By providing the best boating conditions consistent with project purposes and announcing the occurrence of those conditions to boaters in advance, the Bureau would encourage the most efficient use of the river. Depending upon the effectiveness of these measures, the reduction in average annual use attributable to the project would vary from about 870 to 1,470 boater days.

e. Preservation of Scenery

Roads, borrow and riprap sources, canals, pipelines, and other facilities would be located so as to minimize their visual effects whenever practicable. Design criteria, color, and textures would also be used to help blend features into the surrounding landscape. The elevated steel tanks in the Dove Creek area would be painted with an earth tone, for example, and permanent operation and maintenance buildings would have a low profile.

f. Protection from Hazards

Project features have been designed to minimize hazards. Safety devices along canals, at canal structures, and around the dams would include fences, signs, guardrails, and handrails. Concrete-lined canals would have escape ladders and escape mats for humans and wildlife. Dropline cables, floats, nets, and trashracks would be placed above the entrances to such canal structures as siphons, drops, tunnels, and road crossings. All buildings, access facilities, and mechanical and electrical facilities would have fences and warning signs.

g. Land Acquisition and Relocation of Families

All land acquisitions and the relocation of displaced individuals would be accomplished according to provisions of the Uniform Relocation Assistance and Real Property Acquisition Act of 1970 and other applicable Federal legislation and regulations. These acts and regulations require the Government to pay an amount determined to be the fair

market value based on an approved appraisal procedure. In partial takings, the fair market value includes any loss in value to the remainder property (severance damage). In addition to the payment of just compensation, the landowner would be entitled to compensation for relocation expenses as provided by the above Act. All landowners would be advised of acquisition and relocation procedures and assisted in the preparation of applications for reimbursement of relocation expenses and provided with other services required by that Act.

4. Measures Designed to Control the Overall Salinity Levels in the Colorado River

Salinity increases from the Dolores Project and similar water development projects in the Colorado River Basin are expected to be offset by measures authorized by Title II of the Colorado River Basin Salinity Control Act which outlines the Colorado River Basin Salinity Control Project. The Act provides for the construction, operation, and maintenance of four salinity control units as the initial stage of the project. The act also directs the Secretary of the Interior to expedite the investigation, planning, and implementation of other control units throughout the Colorado River Basin.

CHAPTER E

UNAVOIDABLE ADVERSE EFFECTS

E. UNAVOIDABLE ADVERSE EFFECTS

The projected beneficial and adverse environmental impacts associated with the Dolores Project have been discussed in Chapter C. Measures designed to mitigate adverse effects and protect the environment are outlined in Chapter D. This chapter lists the most significant adverse impacts that could not be avoided or fully compensated for.

1. Water Resources

The average annual flows of the Dolores River would be depleted by 105,200 acre-feet, while the Colorado River would be depleted by 80,900 acre-feet downstream from the project return flows. The salt concentration in the Colorado River would be increased by an average of 1.0 mg/l from salt loading and 10.1 mg/l from the project stream depletion as measured at Imperial Dam, thus decreasing the quality of water available for irrigation and municipal and industrial use in the Lower Colorado River Basin.

2. Fish and Wildlife

McPhee Reservoir would inundate stream habitat that now supports small populations of nongame fish and a limited number of brown trout in 10 miles of the Dolores River. It would also inundate habitat for nongame fish in 4 miles of Beaver Creek and 1 mile of Plateau Creek. Dawson Draw Reservoir would inundate nongame fish habitat in about 1 1/2 miles of Dawson Draw. Maintaining more uniform flows with cooler temperatures and reduced turbidity in the Dolores River below McPhee Dam would also have adverse effects on certain species of nongame fish.

All of the project facilities would remove wildlife habitat. The three proposed reservoirs would inundate a total of 4,848 acres, including 4,447 acres of native vegetation and crop land that now supports wildlife to varying degrees and 401 acres of waste land, streambed, and gravel pits. Associated features such as the Great Cut Pumping Plant, recreation sites, and access roads would remove 350 acres of similar habitat and 20 acres of waste land. The project canals, pipelines, and their access roads would result in an additional loss of 320 acres of native growth and crop land. These losses must be regarded as adverse effects even though the development of wildlife management areas and the seeding of the canal rights-of-way would accommodate many of the displaced numbers of wildlife and compensate for the impacts on total populations of the various species.

Losses of deer and elk to drowning because of disrupted migration routes at McPhee Reservoir could not be avoided, nor could any losses that might result from increases in traffic and other human activity. Populations of some of the various species of nongame mammals, furbearers,

varmints, nongame birds, raptors, reptiles, and amphibians now inhabiting the area would be unavoidably reduced because of net reductions in their habitat.

3. Historical and Archaeological Sites

The project would have unavoidable adverse effects on known archaeological sites. Some of the sites would be tested or excavated before construction, while others would be damaged by construction work. In both cases, the sites would be removed and would not be available for future studies and preservation.

4. Scenery

The project structures could be visually unattractive to some people, as would the exposure of foreshore at McPhee and Monument Creek Reservoirs during periods of drawdown.

5. Economic and Social Conditions

During the 9-year construction period, the project work force would place strains on local housing, water and sewage systems, and educational, transportation, police, fire, and health facilities. Housing costs and rental fees would probably increase and would be felt particularly by low income and fixed income families renting housing. Adverse effects would also occur from the relocation of about 120 people in 41 families living in the McPhee Reservoir area. All of the people would have to find new housing, and some could elect to leave the area and find new sources of income and establish new life styles. The project would also have an unavoidable adverse effect in removing 1,218 acres of dry crop land and 2,324 acres of irrigated crop land from agricultural production. Low-grade coal seams north of the Great Cut Arm of McPhee Reservoir would be excluded from possible strip mining as a result of project development. A minor loss in tax revenues would result from the acquisition of private land for project use. Land occupied by project features would be precluded from grazing or other uses.

6. Boating

The project would reduce average annual boating opportunities by about 31 launching days. The resulting loss in recreation use would be from 870 to 1,470 boater days annually. The decreased use would have an economic effect on commercial boaters using the river for all or part of their incomes.

CHAPTER F

SHORT- AND LONG-TERM ENVIRONMENTAL USES

F. SHORT- AND LONG-TERM ENVIRONMENTAL USES

This chapter contains a brief discussion of the extent to which the proposed action involves tradeoffs between short-term environmental gains at the expense of long-term losses, and vice versa, and a discussion of the extent to which the proposed action forecloses future options.

1. Short-Term Gains Compared to Long-Term Losses

Over the short-term, Federal funds provided to construct the project would stimulate the local economy and create a number of new job opportunities. The excavation of archaeological sites would result in an immediate and more refined knowledge of the area's pre-history.

The forced relocation of the 41 families at McPhee Reservoir could be considered a long-term loss, particularly if any of the families lost landholdings which have passed from one generation to another. Relocation could be difficult for such families because of the deep-felt ties they may hold for the land and its relationship to family continuity. From a preservation standpoint the excavation of archaeological sites could be considered a long-term loss.

2. Short-Term Losses Compared to Long-Term Gains

Over the short term, the influx of construction workers to the project area would put stress upon a number of the area's services such as housing, schools, medical services, police and fire protection, and public utilities. Construction and clearing within project rights-of-way would temporarily reduce wildlife numbers and increase stream turbidity and sedimentation. In the early years of project operation, return flows would increase the salt load in the Colorado River, thus degrading the quality of the water for lower basin users. McPhee Reservoir would intersect traditional deer and elk migratory routes and would result in winter wildlife losses.

Over the long term, the water developed by the project would benefit the area's economy by increasing agricultural production and, secondarily, strengthening service-related enterprise which is dependent on the success of agriculture for its survival. The municipal and industrial water provided would satisfy present needs and permit moderate but healthy future growth in the area. McPhee Dam would provide flood protection for downstream landowners. Fishery releases from McPhee Reservoir would create a stream fishery with good public accessibility in the first 11 miles of the Dolores River below McPhee Dam. The fishery would also be improved downstream from that point, but accessibility would remain limited in the lower reaches. The project reservoirs and recreation facilities would provide a variety of new recreation opportunities for the public, but

white-water boating on the Dolores River would be decreased. Land acquired and managed for wildlife would create valuable and unthreatened habitat for a variety of wildlife species. The project could have a long-term benefit on archaeological resources through the nomination of sites to the National Register of Historic Places. This action would aid in the preservation of archaeological sites not excavated or damaged because of project development.

3. Relationships Between Project Development and Future Options for Resource Development

The fuels, power, manpower, and construction materials required for project construction and operation would not be available for other use. Federal funds committed to the project could not be put to other uses.

The development of a portion of Colorado's allocated share of the water in the Upper Colorado River Basin for the Dolores Project would preclude the development and use of this amount of water for other areas of the State.

The inundation of lands and streams would eliminate any alternative use of these areas. These alternative uses could include wildlife habitat, pasture, crop land, homesites, and recreation. The possibility of spinoff developments would further increase the area in which land use changes occurred.

The inundation of archaeological sites would make their future investigation more difficult and expensive if not impossible.

CHAPTER G

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

G. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

A total of 18,259 acres of land now used primarily for agriculture and wildlife habitat would be acquired for project uses. An estimated 5,221 acres of this land would be irreversibly committed to reservoir storage, canals, roads, and other structures. The remaining 13,038 acres would be committed to such long-term project uses as recreational areas, wildlife management areas, and right-of-way. Although this commitment would not necessarily be irreversible, a restoration to present conditions would be difficult. About 16 1/2 miles of poor fish habitat would be flooded and irretrievably lost.

The construction materials irretrievably committed to use would include an estimated 5,476,000 cubic yards of soil, sand, gravel, cobble, and riprap needed for dam embankments and an undetermined amount of the same materials needed for canal banks, roadbeds, and other features. An additional 462,000 cubic yards of pervious material and 24,000 cubic yards of topsoil would be committed to the landfill area at the head of McPhee Reservoir. Concrete aggregate would also be needed and would come from the area, but the quantity is undetermined. Cement and manufactured materials imported from other areas would be irretrievably committed to the project features. Construction would involve the consumption of energy in the form of fuels, explosives, and electrical power. After construction, electricity would be consumed, primarily for the pumping plants.

With full project development, the use of project water would involve an irretrievable depletion of the Lower Colorado River of 80,900 acre-feet each year. Water uses could be changed in the future, however. Boating flows on the Dolores River would be reduced by the commitment of water to project uses.

Archaeological resources would be irreversibly disturbed through testing, excavation, or damage during project construction. The project would entail a commitment of 215 known archaeological sites, including 78 from construction and inundation alone, 59 from the test and excavation alone, and 78 from both activities.

The project would irreversibly alter the scenery in local areas by the imposition of man-made structures, excavation scars, and embankment slopes onto the landscape.

CHAPTER H

ALTERNATIVES TO THE PROPOSED PLAN

H. ALTERNATIVES TO THE PROPOSED PLAN

1. General

The Bureau has investigated many alternatives in order to derive a plan that would economically serve the water needs of the area while producing the smallest adverse environmental impact. Many of the alternatives were dismissed after a cursory investigation because of physical reasons, such as geologic risks or insufficient water supplies, or because of economic reasons, such as high construction costs. This chapter discusses the alternatives in terms of (1) modifications of the proposed plan to provide essentially the same benefits, (2) alternative uses of the available water that separately could serve different needs of the project area, and (3) nondevelopment. Table H-1 summarizes the impacts of the alternatives, and Figure H-1 shows the locations of the alternative features.

2. Modifications of Proposed Plan

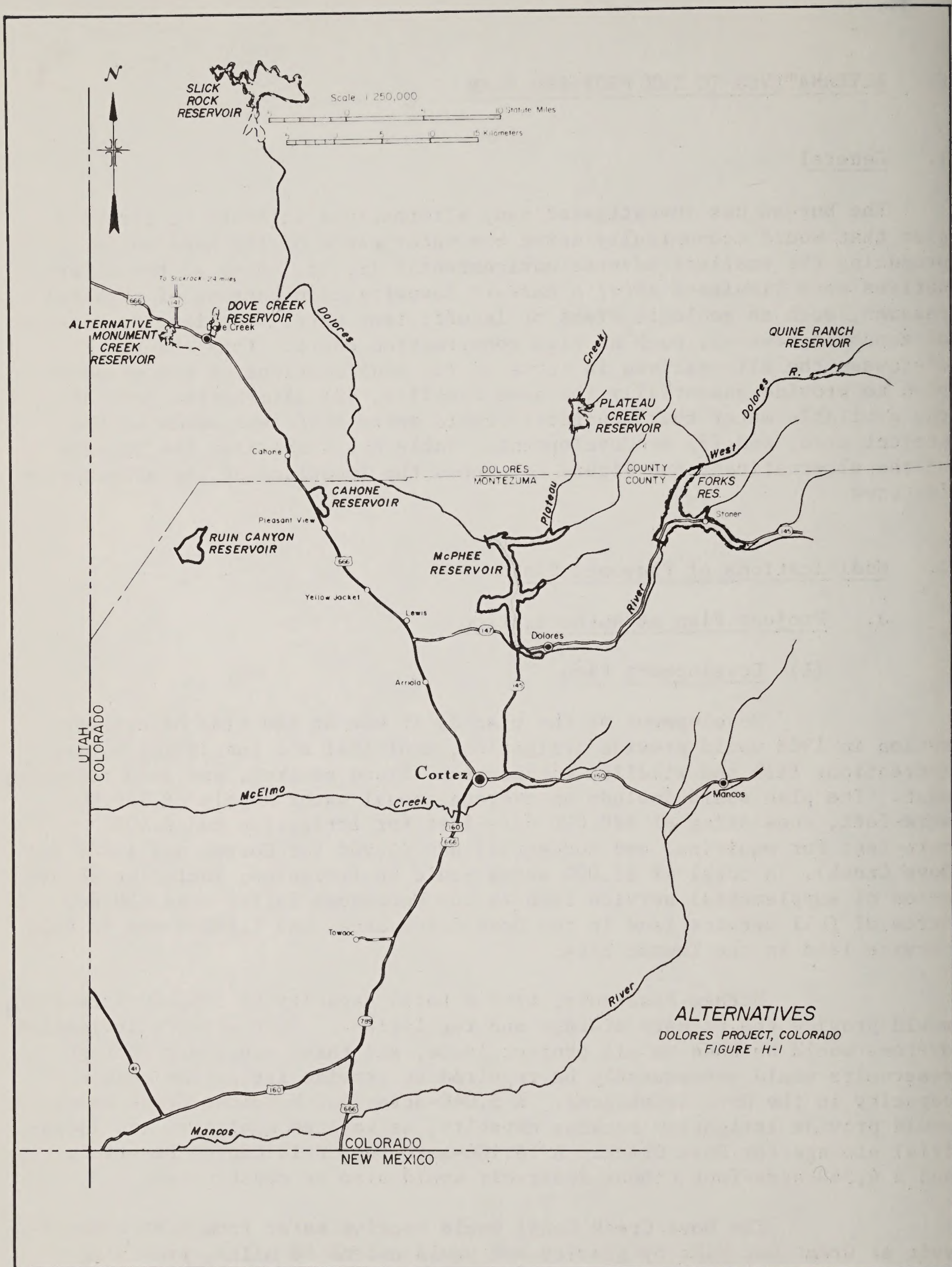
a. Project Plan at Authorization

(1) Development Plan

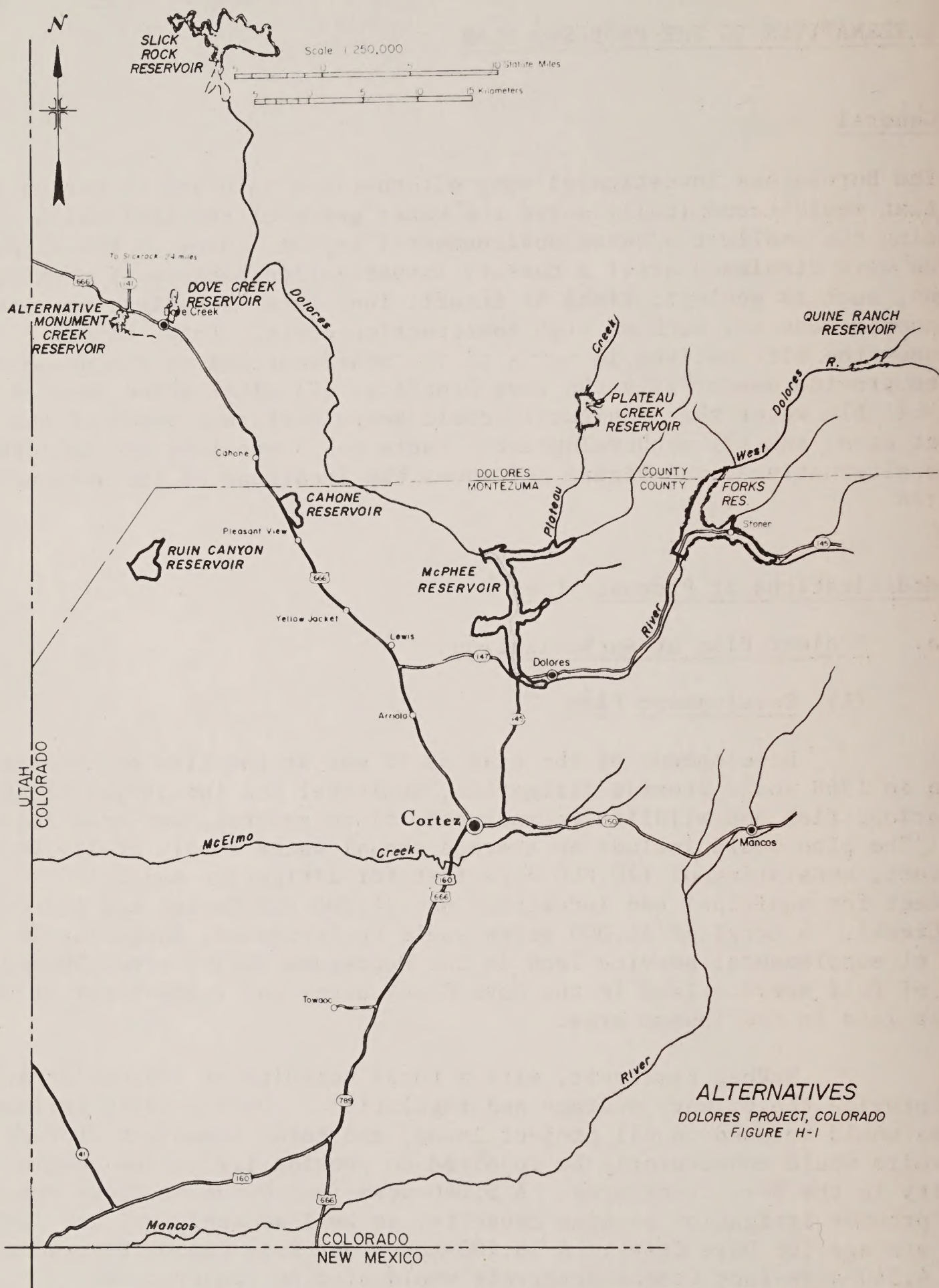
Development of the plan as it was at the time of authorization in 1968 would provide irrigation, municipal and industrial water, recreation, fish and wildlife enhancement, flood control, and area redevelopment. The plan would include an average annual water supply of 126,900 acre-feet, consisting of 120,800 acre-feet for irrigation and 6,100 acre-feet for municipal and industrial use (4,900 for Cortez and 1,200 for Dove Creek). A total of 61,000 acres would be irrigated, including 28,660 acres of supplemental service land in the Montezuma Valley area, 30,840 acres of full service land in the Dove Creek area, and 1,500 acres of full service land in the Towaoc area.

McPhee Reservoir, with a total capacity of 364,000 acre-feet, would provide the primary storage and regulation. Open gravity irrigation systems would be used on all project lands, and three secondary storage reservoirs would consequently be required to provide irrigation peaking capacity in the Dove Creek area. A 5,040-acre-foot Monument Creek Reservoir would provide irrigation peaking capacity, as well as municipal and industrial storage for Dove Creek. A 16,400-acre-foot Ruin Canyon Reservoir and a 4,340-acre-foot Cahone Reservoir would also be constructed.

The Dove Creek Canal would receive water from McPhee Reservoir at Great Cut Dike by gravity and would extend 68 miles, providing water for Monument Creek and Cahone Reservoirs. The South Canal would



Alternative uses of water		
Municipal and indus- trial only	Stream improve- ment only	Stream improve- ment and white-water boating only
8,700		
	37,300	89,300
		37,300
8,700	37,300	126,600
8,700		
4,350		
4,350	6,000	1,200
Significant decrease	Insignificant decrease	Insignificant decrease
Significant decrease	Insignificant decrease	Insignificant decrease
Significant decrease	Insignificant decrease	Insignificant decrease
Significant decrease	Significant decrease	Significant decrease
1,450		
0.5		
	50-35	150-85
	7	7
Negligible	81,970	89,480



ALTERNATIVES
DOLORES PROJECT, COLORADO
FIGURE H-1

Table H-1
Summary of alternatives

	Modifications of proposed plan						Alternative uses of water		
	Proposed plan	Plan at authorization	Proposed plan with Plateau Creek Reservoir	Proposed plan with Slick Rock Reservoir	Proposed plan with Forks Reservoir	Irrigation only	Municipal and industrial only	Stream improvement only	Stream improvement and white-water boating only
Water supply (average annual acre-feet)									
Irrigation	90,900	120,800	90,900	90,900	90,900	126,600	8,700		
Municipal and industrial use	8,700	6,100	8,700	8,700	8,700				89,300
Recreation			10,700	27,800				37,300	37,300
Fish and wildlife	27,000		27,000	26,200	27,000				
Total	126,600	126,900	137,300	153,600	126,600	126,600	8,700	37,300	126,600
Irrigable lands (acres)									
Full service									
Dove Creek area	27,860	30,840	27,860	27,860	27,860	46,100			
Towaoc area	7,500	1,500	7,500	7,500	7,500	7,500			
Supplemental service (Montezuma Valley area)	26,300	28,600	26,300	26,300	26,300	26,300			
Total	61,660	60,940	61,660	61,660	61,660	79,900			
Environmental evaluation									
Water resources (average annual acre-feet)									
Diversion from Dolores River	105,200	126,900	105,200	105,200	105,200	126,600	8,700		
Return flow to San Juan River	25,000	39,600	25,000	25,000	25,000	27,600	4,350		
Net depletion of Colorado River	80,900	87,300	81,300	82,100	80,900	99,000	4,350	6,000	1,200
Fish and wildlife ^{1/}									
Habitat removal		Same as proposal	Insignificant increase	Insignificant increase	Insignificant increase	Insignificant decrease	Significant decrease	Insignificant decrease	Insignificant decrease
Fish and wildlife disturbance		Same as proposal	Insignificant increase	Insignificant increase	Insignificant increase	Significant increase	Significant decrease	Insignificant decrease	Insignificant decrease
Scenery alterations ^{1/}		Significant increase	Insignificant increase	Insignificant increase	Insignificant increase	Same as proposal	Significant decrease	Insignificant decrease	Insignificant decrease
Construction costs ^{1/}		Insignificant difference	Insignificant increase	Insignificant increase	Significant increase	Insignificant increase	Significant decrease	Significant decrease	Significant decrease
Salinity effects									
Salt loading (tons/year)	10,080	37,000	10,080	10,080	10,080	10,080	1,450		
Effect at Imperial Dam (mg/l) ^{2/}	11.1	14.2	11.1	11.1	11.1	13.3	0.5		
Effects on Dolores River below McPhee								50-35	150-85
Minimum river flows (second-feet)	50	0	70	50	50			7	7
Recreation facilities (sites)	7	0	7	7	7				
Recreation days									
At McPhee Reservoir	186,600	186,600	186,600	186,600					
Below McPhee Reservoir	80,500	Negligible	81,870	83,120	^{3/} 80,500	Negligible	Negligible	81,970	89,480

^{1/} Expressed as difference from proposed plan.

^{2/} Combined effects of depletion and salt loading, based on modified 1976 conditions, as discussed in Section 5-d.

^{3/} Additional benefits would be realized in Dolores River from Forks Dam site to McPhee Dam site.

branch from the Dove Creek Canal and carry water to Ruin Canyon Reservoir. Distribution canals and laterals would receive water directly from turn-outs on the Dove Creek Canal or from releases from the three reservoirs and would serve the full service land in the Dove Creek area.

Monument Creek Reservoir, located about 2 miles west of Dove Creek and about 2 miles southwest of the reservoir site used in the proposed plan, would receive water whenever the entire capacity of the Dove Creek Canal was not required for irrigation, and stored water would subsequently be released to the Monument Creek Canal to irrigate about 1,500 acres. The community of Dove Creek would be required to pump municipal and industrial water from the reservoir about 260 feet in elevation to its treatment facilities.

Major diversions from the Dove Creek Canal for the Montezuma Valley and Towaoc areas would be made near the canal head to the proposed Great Cut Canal and Narraguinnep Draw. The Great Cut Canal would extend to the southeast for about 10 miles to the Montezuma Valley area and, in combination with existing canals, would deliver project and nonproject water for irrigation and for municipal and industrial use in Cortez. Existing canals would also convey water through Montezuma Valley to the Towaoc area. Both the Dove Creek and Great Cut Canals would replace some existing conveyance works in the Montezuma Valley area.

As in the proposed plan fisheries and recreation developments would be provided at project reservoirs. Project funds would be provided for mitigation of wildlife losses caused by the project.

The project would divert an average of about 126,900 acre-feet annually from the Dolores River and return about 39,600 acre-feet, resulting in a depletion of the Colorado River of about 87,300 acre-feet. The depletion would be about 6,400 acre-feet more than in the proposed plan. The stream depletion and the annual salt load of about 37,000 tons picked up from project uses would increase the salinity of the Colorado River at Imperial Dam by about 14 mg/l.

(2) Environmental Impacts

By irrigating about 3,000 more acres of full service land in the Dove Creek area and about 3,200 more acres of supplemental service land in the Montezuma Valley area than would be served by the proposed plan, the alternative would provide more benefits to irrigators in those two areas. Economic benefits accruing to the Ute Indian Tribe would be significantly less, however, since in the Towaoc area about 6,000 fewer acres would receive irrigation water. On balance, it is believed that the proposed plan offers greater social and economic benefits to a wider range of people than the plan at time of authorization.

The impacts on water quality would be substantially greater under the feasibility plan than the proposed plan. Because sprinkler systems would not be employed on the full service lands, the

annual stream depletion would be about 6,400 acre-feet greater and the salt load in return flows about 26,920 tons greater.

Additional reservoir fisheries would be developed at Ruin Canyon and Cahone Reservoirs. Proposed project releases would not be sufficient to establish a fishery in the Dolores River downstream from McPhee Reservoir, and releases in anticipation of snowmelt inflow could not be as readily managed for white-water boating as in the proposed plan. Ruin Canyon and Cahone Reservoirs would inundate additional wildlife habitat, as would the larger Monument Creek Reservoir. The use of open gravity canals and laterals would result in more habitat for wildlife associated with water, as would the larger return flows with this plan. The irrigation of additional dry-farmed land in the Dove Creek area would eliminate some additional big game habitat but would improve habitat for some small game species. Because there would be 6,000 less acres of irrigable land in the Towaoc area, the effect on wildlife, particularly prairie dogs, would be less in that area than in the proposed plan. Since Dawson Draw Reservoir would not be constructed under this alternative, the overall beneficial environmental effects of this feature would not be realized. The plan did not include a wildlife management area. Maintenance of the gradient of the Dove Creek Canal with a lower elevation than in the proposed plan would result in several unsightly deep cuts.

This alternative would probably have about the same impacts on archaeological sites as the proposed plan. McPhee Reservoir and the Dove Creek and South Canals and laterals would affect roughly the same number of sites. The Dolores River below McPhee and the Towaoc Canal right-of-way, where 117 sites were inventoried, would not be affected, but the addition of Ruin Canyon and Cahone Reservoirs could affect enough additional sites to negate this decrease. The impact cannot be accurately estimated since the reservoir sites have not been inventoried.

b. Addition of Plateau Creek Reservoir to Proposed Plan

(1) Development Plan

The construction of Plateau Creek Reservoir, located on a tributary of the Dolores River above McPhee Dam, would add 10,700 acre-feet of firm yield to the project water supply for white-water boating or further enhancement of the Dolores River flows below McPhee Dam. The reservoir would be at an elevation of about 7,600 feet in an area covered by native grass land. The reservoir would fill in the spring to a surface area of 275 acres and, if used for boating flows on the Dolores, would be almost emptied by fall. Flows would be released into Plateau Creek and then stored in McPhee Reservoir. An annual average use of about 2,700 boater days would be provided from release of the 10,700 acre-feet at a rate of 1,000 second-feet, or flows in the river could be increased by about 10 second-feet in the winter and 20 second-feet in the summer in addition to proposed releases from McPhee Reservoir storage.

(2) Environmental Impacts

Plateau Creek Reservoir would inundate about 275 acres of wildlife habitat and about a mile of Plateau Creek, a small mountain stream that supports a population of nongame fish. The reservoir basin is heavily used by deer and elk, especially during winter months. Additional lands would be required to compensate for the loss of wildlife habitat. Because of the extreme fluctuation and lack of a permanent pool in the reservoir, there would be no direct fishery or recreation value at the reservoir. Although some additional fishing benefits could be realized in the Dolores River, the construction and operation costs and the adverse environmental impacts on Plateau Creek would outweigh those benefits. The project would provide about 2,700 boater days annually, a decrease of about 100 boater days from present conditions.

This plan would have essentially the same effects on archaeological sites as the proposed plan, since the only difference would be the inundation of 275 acres by Plateau Creek Reservoir. Although the site has not been inventoried, the small area involved would probably contain few, if any, archaeological sites.

c. Addition of Slick Rock Reservoir to Proposed Plan

(1) Development Plan

Slick Rock Reservoir would be located about 50 miles downstream from McPhee Dam at an elevation of about 5,500 feet in the Dolores River Canyon. The vegetative cover is primarily pinon and juniper trees. The reservoir would be added to the proposed plan to provide additional white-water boating flows. With a capacity of about 26,000 acre-feet, it would collect flows released at McPhee Dam for the maintenance of the stream fishery, averaging 25,400 acre-feet annually. Releases from Slick Rock Reservoir would be made in the most desirable manner to provide boating for a distance of about 47 river miles to Bedrock.

(2) Environmental Impacts

The increased costs and the adverse environmental impacts of this alternative appear to far outweigh the 3,955 boater days of use provided (an increase of 1,150 over existing conditions). The reservoir would interrupt boaters from upstream, who would have to go around the site to continue their trips. In addition, the location of the reservoir would conflict with wild and scenic river proposals for this reach of the river. Wildlife habitat in the canyon would also be lost by inundation. Several miles of stream fishery within the reservoir site would be replaced by a fluctuating reservoir. Downstream fishery values would also be reduced since all streamflows at this reservoir would be stored for release during the boating season. Because of its highly fluctuating nature (it would be empty most of the year) and its inaccessibility, the reservoir would have very little value as a fishery.

The addition of Slick Rock Reservoir to the proposed plan could increase the number of archaeological sites affected by the project. Since the area has not been inventoried, the impact has not been estimated.

d. Substitution of Forks Reservoir for McPhee Reservoir

(1) Development Plan

Planning studies have identified only one other site on or off the Dolores River for a major storage reservoir that would allow a scale of development comparable to McPhee Reservoir. The site is located about 12 miles upstream from the town of Dolores, just below the confluence of the Dolores River and the West Dolores River. The physical and biological characteristics of the site are quite similar to those at McPhee although the reservoir basin would be located in a relatively steep-walled canyon at about 8,000 feet in elevation. Vegetative growth is slightly more lush than at McPhee because of increased precipitation. Wildlife habitation is very similar, including deer and elk winter range. The Stoner ski area is located within the basin, as is State Highway 145 connecting Dolores and Rico.

Forks Reservoir, with a total capacity of about 270,000 acre-feet forming a maximum water surface of 2,700 acres, would provide about the same average annual water supply as McPhee Reservoir. The inactive capacity would be much smaller, however, resulting in more drastic drawdowns during the irrigation season. Stored water supplies would be released into the river and diverted at the diversion dam of the Montezuma Valley Irrigation Company, which would be rehabilitated. Then the flows would be conveyed in the company's Main Canal No. 2 to the Great Cut Pumping Plant where they would be lifted into the Dove Creek Canal. The Great Cut Canal, beginning near the head of the Dove Creek Canal, would carry water about 10 miles southeast to the Towaoc Canal and the Cortez-Towaoc Pipeline.

All of the other project facilities discussed in the proposed plan would be the same, as would the allocations of water for irrigation, municipal and industrial use, recreation, and fish and wildlife.

(2) Environmental Impacts

The construction of Forks Reservoir would not require the relocation of as many families as would McPhee Reservoir, nor would it probably be as disruptive to as many archaeological sites. It would, however, be substantially more costly, primarily because of the forced highway relocation. It would interfere with a section of the Dolores River which has been included in the Wild and Scenic River proposal, and it would not be as valuable as a recreational resource because of the accessibility problems its steep shores would pose.

From a fish and wildlife standpoint Forks Reservoir would inundate less wildlife habitat, although the reservoir site is heavily

used by deer and elk during the critical winter months. Mitigation requirements would be about 1,800 acres less than in the proposed development. The reservoir would inundate productive trout habitat in 7 miles of the Dolores River and 4 miles of the West Dolores River. However, 10 miles of the Dolores River in the proposed McPhee Reservoir site could be rehabilitated into a trout fishery in addition to the improved stream habitat provided below McPhee.

3. Alternative Uses of Water

a. Development of Irrigation Water Only

(1) Development Plan

McPhee Reservoir would provide a sufficient water supply to irrigate 79,900 acres if all of the water were allocated for that purpose. This acreage would be obtained by adding 18,240 acres of full service land in the Dove Creek area, bringing its total to 46,100 acres, while keeping the Towaoc area at 7,500 acres and the Montezuma Valley area at 26,300 acres. This alternative would require increased capacities for the Great Cut Pumping Plant, the Dove Creek Canal, and the South Canal, and additional sprinkler pumping plants, laterals, and drains for the Dove Creek area.

Monument Creek Reservoir, Dawson Draw Reservoir, and the Cortez-Towaoc Pipeline would be eliminated since they would not provide irrigation service. Recreation facilities around McPhee Reservoir would be reduced, and those along the Dolores River would probably also be removed from the plan. The construction cost necessary to develop the water resources in this manner would be about 10 to 15 percent higher than the cost of the proposed plan.

(2) Environmental Impacts

By increasing the acreage of full service land, this plan would increase economic benefits to agricultural interests. Project water, however, would not be supplied to satisfy the area's municipal and industrial water needs, thus forcing alternative and perhaps haphazard development to satisfy those needs. The use of the resources for irrigation only would also have a greater effect on water quality in the Lower Colorado River Basin than the proposal. Stream diversions, depletions, and irrigation return flows would be greater, and the salinity of the Lower Colorado River would be increased by a larger amount. Without the provision of minimum flows, the river would continue to dry up nearly every year, necessitating a reevaluation of the wild and scenic river proposal. Recreation opportunities would be diminished by the elimination of Monument Creek Reservoir, the elimination of fishing releases from McPhee Reservoir, and the greater water surface fluctuation in McPhee Reservoir.

The development of an additional 18,240 acres of full service irrigated land in the Dove Creek area would eliminate some big game winter range. Additional habitat for some game and nongame small mammals and birds would be established. The overall beneficial effects of Monument Creek and Dawson Draw Reservoirs on fish and wildlife resources would be eliminated. Other impacts on wildlife would be similar to those in the proposed plan. Under this alternative the fishery potential of about 56 miles of the Dolores River would not be realized as in the proposed development. The quality of the fishery in McPhee Reservoir could be somewhat reduced because of the greater fluctuation of the single purpose reservoir. The impacts on archaeological sites would be comparable to those of the proposed plan, although the addition of 18,240 acres of land in the Dove Creek area could adversely affect an unknown number of sites. Overall, the proposed plan is responsive to a wider range of public needs and environmental concerns at less cost.

b. Development of Municipal and Industrial Water Only

(1) Development Plan

The most economical alternative for meeting the municipal and industrial water needs of the area would be to construct the Quine Ranch Reservoir, located at about 8,500 feet in elevation on the West Dolores River. With a surface area of 175 acres and a total capacity of 7,000 acre-feet, the reservoir would provide an average annual water supply of 6,500 acre-feet for Cortez, 1,000 acre-feet for Towaoc, and 1,200 acre-feet for Dove Creek and rural areas. The stored water would be released into the river, diverted at the facilities of the Montezuma Irrigation Company, and conveyed through the company's existing tunnel in a project pipeline to a treatment plant which would be constructed by the water users. Two project trunk lines, a 21.5-mile pipeline to Cortez and Towaoc and a 31.4-mile pipeline to Dove Creek, would deliver the treated water to existing distribution systems.

(2) Environmental Impacts

While this alternative would satisfy the area's municipal and industrial water needs, it would not strengthen the agricultural base of the area's economy. Flood control would not be provided. The benefits to recreation would be extremely limited with this plan, and it could be desirable to reevaluate the proposed designation of the Dolores River below McPhee Reservoir as a wild and scenic river. The recommendations that certain segments be designated as wild, scenic, or recreational were "based on the premise that the Dolores Project will be constructed. Its construction will enhance the outstanding wild and scenic values of the Dolores River by ensuring that a live streamflow will be maintained below McPhee Dam."^{1/} The impacts upon the area's archaeological resources would be negligible. The use of the resource would have a smaller

^{1/} Colorado Department of Natural Resources, U.S. Department of Agriculture, and U.S. Department of the Interior, Dolores River Wild and Scenic River Study Report (December 1975), p. IV.

impact on the water quality of the Lower Colorado River than would the proposed plan. Salinity increases would result from both stream depletions and salt loading but would be minor. The effects of this alternative on fish and wildlife resources would be very small. About 175 acres of wildlife habitat would be inundated by the reservoir as would about a mile of the West Dolores River. A cold-water put-and-take fishery could be developed in Quine Ranch Reservoir.

c. Stream Improvement Only

(1) Development Plan

This alternative would provide only enough water to improve the Dolores River as a stream fishery. A small McPhee Reservoir, with a total capacity of 30,000 acre-feet and a surface area of 720 acres, would be constructed and would provide an average annual water supply of 37,300 acre-feet. Releases at the dam would produce minimum streamflows of 70 second-feet from May through October and 35 second-feet during the rest of the year.

(2) Environmental Impacts

Under this proposal, the flows of the Dolores River would be restored to essentially pristine conditions, thus benefiting the river as a fishery. The needs of agriculture and municipal and industrial water users would not be served. Flood control and recreation benefits would also be sharply reduced. The salinity of water in the lower Colorado River would remain essentially unchanged. Use of water for a fishery would deplete the river by only 1,200 acre-feet from reservoir evaporation and would contribute no measurable additional salt. Impacts on vegetation and wildlife would be relatively small. About 720 acres of land providing winter range for big game and year-round habitat for other species would be inundated. Increased human activity could also disturb the animals in the area. This alternative, involving only a small McPhee Reservoir, would have negligible impacts on archaeological sites. Some of the 57 sites identified within the 4,470-acre reservoir in the proposed plan could also be affected by the 720-acre reservoir in the alternative.

d. Stream Improvement and White-Water Boating

(1) Development Plan

This alternative would be based upon utilizing the entire project water supply of 126,600 acre-feet a year for a stream fishery and white-water boating in the Dolores River below McPhee Dam. The only facilities of the alternative would be McPhee Reservoir and recreation facilities at the reservoir and along the river. The stream fishery would be created by an average annual supply of 37,300 acre-feet, with constant releases of 70 second-feet during the summer and fall (May 15 - October 31) and 35 second-feet during the remainder of the year. White-water boating would be enhanced by a supply of 89,300 acre-feet with

average releases of 1,000 second-feet. About 10,310 boater-days of use would be provided on an average annual basis. With the increased flows, the wild and scenic river values would be enhanced. Costs for recreational development at the reservoir and downstream from the dam would be the same as in the proposal.

(2) Environmental Impacts

The alternative would provide benefits for recreation, fish and wildlife, and flood control. It would not, however, meet the local needs for irrigation and municipal and industrial water. This use of the Dolores River would produce smaller economic and social impacts than the proposed plan. Impacts on vegetation, fish, and wildlife would be confined to the Dolores River valley. McPhee Reservoir would inundate about 4,500 acres of winter range for big game and habitat for other species as described for the proposed plan. The reservoir would, however, provide habitat for fish and water-oriented wildlife as in the proposed plan. The Dolores River below McPhee Dam would be generally improved for a variety of wildlife although increased human recreational activities could disturb some species. Fish habitat in the river would be considerably enhanced for cold water game species. The uses of the Dolores River would have little effect on the water quality of the Lower Colorado River. The annual stream depletion, resulting from reservoir evaporation, would amount to only 6,000 acre-feet, as compared to 80,900 acre-feet for the proposed plan, and no salt loading would occur. The plan would affect part of the 155 archaeological sites identified in the vicinity of McPhee Reservoir and the 40 sites along the Dolores River below McPhee Dam. The total of 195 sites is slightly less than half of the 487 sites identified in the area of the proposed plan.

4. Nondevelopment

The discussion of nondevelopment is restricted to conditions that would exist without development of a Federal project. Although other entities could potentially develop the water for agriculture or for industrial purposes, the high costs involved render it doubtful that any extensive irrigation developments would be undertaken without government involvement. Financing an irrigation development of any magnitude, however, would be a problem for a small entity and would be a limiting factor for any such attempt. From an environmental standpoint, there would be, in the event of a private development, no assurance of minimum streamflows, inactive reservoir capacity for recreation, public recreation facilities, public access to streams, or mitigation of wildlife habitat or boating losses. Nondevelopment would also affect the proposed wild and scenic river designation below McPhee Dam since the river would continue to dry up nearly every year. White-water boating flows would remain uncontrolled and would be used at the levels allowed by recreation needs and river management plans.

Agriculture would probably deteriorate as the slowly growing population placed increasing demands upon the available resources. Water presently used for irrigated farming would be gradually converted to municipal and industrial uses. The chronic late-season irrigation shortages, the continued emigration of youth from the farm, and the increasing age of the farm owners would all contribute to increased pressures on the agricultural economy.

Without the project, losses of wildlife habitat by irrigation or reservoir inundation would be unlikely. Game animals would probably be maintained at or near their present populations, and other species should also remain fairly stable. The fishery in the Dolores River downstream from the town of Dolores would remain in its present condition. It is very unlikely that Dawson Draw Reservoir would be constructed for fish and wildlife purposes.

Tourism and recreation would continue to increase as in the past. The scenic qualities of the area would be unchanged, particularly since non-Federal water developments of any consequence are unlikely. Construction activities similar to project construction activity which would alter the landscape would probably not occur in the near future. Therefore, any dramatic altering of the landscape would be avoided, and project-related impacts on archaeology would not occur.

The population would grow at only a slightly lower rate than with the project, and to support at least part of this growth, municipal and domestic water could be obtained by increased efficiencies of water use and the conversion of some water now used for irrigation. Most of the growth would continue to occur in the vicinity of Cortez.

CHAPTER I

CONSULTATION AND COORDINATION

I. CONSULTATION AND COORDINATION

1. Development of the Proposals

In formulating the proposed plan, the Bureau of Reclamation received planning assistance and evaluations of project purposes and benefits from several Federal agencies, including the Bureau of Indian Affairs, the Bureau of Land Management, the Forest Service, the Corps of Engineers, the Fish and Wildlife Service, the National Park Service, the Bureau of Mines, the Public Health Service, the Bureau of Outdoor Recreation, and the Environmental Protection Agency. Written reports were also submitted by the Forest Service and the Fish and Wildlife Service. These documents are listed in the bibliography. State and local agencies have also actively participated in the investigations, including the Colorado Water Conservation Board, the Colorado Division of Wildlife, the Southwestern Water Conservation District, the Dolores Water Conservancy District, the Montezuma Valley Irrigation Company, the Ute Mountain Ute Indian Tribe, and local governments.

2. Preparation and Review of the Draft Environmental Statement

a. Preparation of Statement

Federal, State, and other agencies and organizations provided information concerning the present environment and anticipated impacts of the project and recommended mitigation and enhancement measures. As another means of contributing to the draft environmental statement, various entities commented on an environmental assessment that was circulated for review by the Bureau of Reclamation in June 1975. Several organizations provided substantial data under the terms of contracts dealing with the project. The Fish and Wildlife Service conducted an inventory of fish and wildlife on the Ute Mountain Ute Indian Reservation, and the Colorado Division of Wildlife provided a similar study on the rest of the project area. Reports on the flora and on the reptiles and amphibians of the area were prepared by Fort Lewis College. The University of Colorado, under contract with the National Park Service, has reported on the archaeological resources of the area. In addition to these reports, the Bureau of Reclamation has obtained information from the published materials of various agencies.

b. Distribution of Statement

When the Draft Environmental Statement (DES 76-44) was released in November 1976, approximately 350 copies were distributed for review to Federal, State, and local agencies and to water users' organizations, conservation groups, educational institutions, news media, and individuals. Copies were also made available for public inspection at public,

college, and university libraries. Agencies and organizations receiving the draft statement and those commenting thereon are indicated in the distribution list near the front of this statement.

The review period for the draft environmental statement began with the notice of availability published in the Federal Register of November 4, 1976. The review period officially ended December 20, 1976; however, written comments received after that date have been accepted and considered in preparation of this final statement.

c. Public Hearing

A formal public hearing was held December 4, 1976, to receive comments on the Draft Environmental Statement. Notice of the hearing was made in the Federal Register of November 4, 1976. The hearing was held in the District Courtroom of the Montezuma County Courthouse in Cortez, Colo. It convened at 10:00 a.m. and adjourned at about 1:45 p.m. after all who wished had testified. The hearing was conducted by Roland G. Robison, Assistant Regional Solicitor for the Department of the Interior, Salt Lake City, Utah. Regional Director, David L. Crandall, Upper Colorado Region, Salt Lake City, Utah, and Senior Staff Officer, Wayne E. Cook, Western Colorado Projects Office, Durango, Colo., were present to officially represent the Bureau of Reclamation and to receive testimony.

Approximately 60 people signed the attendance registration for the hearing. A total of 15 persons presented oral testimony. Following is a list of those testifying in the order in which they appeared.

<u>Name</u>	<u>Representing</u>
Val Truelsen	City of Dolores
Rob Hooper	San Juan Board of Cooperative Services (unofficially)
Frank Sam Maynes	Southwestern Colorado Water Conservation District
Preston Ellsworth	Colorado Rivers
Jim O'Brien	Self
Ben C. Hoy	Ute Mountain Agency
Robert Leighton	Self
Bruce McAfee	Dolores Water Conservancy District
Roy Crow	Self
Walter Ertell	Montezuma Valley Irrigation Company
Jerry Koskie	Self
Nancy Colbert	Self
Curtis Honaker	Montezuma County Commissioner
Margaret Batten	Self
Danny Randall	Self

A verbatim transcript of the hearing was recorded by an official reporter. This transcript has been bound and is available for public

inspection at the locations listed below. Copies of the transcript can be purchased from the reporter, Beverly Larkee, c/o La Plata County Courthouse, 1060 2nd Ave., Durango, Colo. 81301.

Office of Ecology
Room 7620
Bureau of Reclamation
Department of the Interior
Washington, D.C. 20240

Regional Director
Bureau of Reclamation
Room 7223, Federal Building
125 South State Street
Salt Lake City, Utah 84147

Cortez Public Library
700 East Montezuma Avenue
Cortez, Colo. 81321

Division of Engineering Support
Technical Services and
Publications Branch
Bureau of Reclamation
Engineering and Research Center
Denver Federal Center
Denver, Colo. 80225

Western Colorado Projects Office
Bureau of Reclamation
Building 8, ERDA Compound
Grand Junction, Colo. 81501

Western Colorado Projects Office
Bureau of Reclamation
Room 400, West Building
Durango, Colo. 81301

Several people spoke in favor of the project and indicated approval of the adequacy of the Draft Environmental Statement. Several others, however, voiced concern over the project and the adequacy of the statement. The major concerns raised at the hearing centered on the effects of reservoir construction on the town of Dolores, impacts on public education, white-water boating issues, and economic justification of the project. The Bureau of Reclamation's responses to the comments of Messers. Hooper, Ellsworth, and O'Brien are included in the written comments section, specifically Sections I-3c and I-3d, and are not, therefore, summarized here. A summary of all other major concerns raised and appropriate responses to them are as follows.

Concern No. 1: The environmental effects of the project on the town of Dolores, particularly the relocation of people, ground water levels, and disruption of storm drains and the sewage treatment plant, were not adequately addressed in the Draft Environmental Statement.

The discussion of the relocation of people has been expanded significantly in Sections A-6a(2), C-13b, and D-3g.

The possibility of McPhee Reservoir's influencing the ground water levels in the town of Dolores is quite remote. Nevertheless, as an added precaution, Reclamation is currently monitoring a grid of observation wells within the town. It would continue to monitor the observation wells during project construction and if the ground water table should unexpectedly rise because of reservoir filling, appropriate measures would be taken to control it.

The town of Dolores does not have a storm drain system. Storm runoff is carried by surface drains to the river. The landfill area

would not inhibit surface runoff. Except for a cover of topsoil, the landfill would be composed primarily of gravels and cobbles which would readily accept runoff. In fact, the landfill area would eliminate standing water or bog-like areas which may presently occur directly downstream from the town after storms.

As explained in Section A-6a(2), project funds would provide for the design, relocation, and construction of a new treatment plant meeting modern effluent standards. The plant would meet present needs, but Reclamation has no authority to fund an enlarged plant in anticipation of future growth.

Concern No. 2: The fate of the cemetery at the McPhee town site has not been discussed.

As stated in Section A-6a(2) of the statement, the McPhee cemetery would be moved to a new location. This action would be accomplished in accordance with applicable Federal and State laws.

Concern No. 3: The basis for allowing a few people to remain in the landfill area while requiring most people to relocate has not been explained.

All persons presently residing within the landfill area would have to relocate. The relocation of the persons is discussed in Section A-6a(2), C-13b, and D-3g.

Concern No. 4: Several problems would be resolved if the reservoir were allowed to backup only to the bridge on Highway 145.

With the construction of the landfill area and the upgrading of the dikes in the town of Dolores, water would be restricted to the river channel upstream from the bridge even when the reservoir was at the top of active capacity.

d. Written Comments

Numerous written comments on the Draft Environmental Statement have been received by the Bureau of Reclamation. Some of the views expressed in these comments parallel those given at the public meeting, but in total they cover a much wider range of concern. Copies of the written comments are included at the end of this chapter. The letters are grouped alphabetically in four categories as follows: (a) Federal agencies, (b) State and local governments, (c) private organizations, and (d) individuals. The originals of these written comments are on file in the Upper Colorado Regional Office of the Bureau of Reclamation in Salt Lake City, Utah.

3. Disposition of Comments Received on Draft Statement

All review comments received by the Bureau of Reclamation, both written and oral, have been considered in the preparation of this Final Environmental Statement. The statement has been expanded and modified where appropriate to accommodate the input received in these comments.

Where response is appropriate, each letter reproduced in this chapter is followed by a memorandum which responds to the viewpoints raised. Some of the letters require no response, but their receipt is acknowledged.

a. Comments from Federal Agencies

Department of the Interior

Bureau of Indian Affairs

Bureau of Land Management

Bureau of Mines

Bureau of Outdoor Recreation

Fish and Wildlife Service

Office of the Director

Colorado-Utah Area Office

Geological Survey

National Park Service

Advisory Council on Historic Preservation

Department of Agriculture

Department of the Army, Corps of Engineers

Department of Health, Education, and Welfare

Office of the Secretary

Public Health Service

Department of Housing and Urban Development

Environmental Protection Agency

Federal Energy Administration

Environmental
Quality - 300

United States Department of the Interior

BUREAU OF INDIAN AFFAIRS

ALBUQUERQUE AREA OFFICE

P.O. BOX 8327

ALBUQUERQUE, NEW MEXICO 87108

DEC 23 1976

Memorandum

To: Commissioner, Bureau of Reclamation, Washington, D. C.

From: Area Director

Subject: Review of Draft Environmental Statement - Dolores Project,
Colorado (DES 76/44)

We have reviewed the subject statement within our expertise and jurisdiction and have the following comments to make.

GENERAL COMMENTS:

While realizing there are some adverse impacts that are unavoidable, we believe the overall benefits of the Project to the Ute Mountain Ute Reservation and the rest of the project area to be very substantial.

SPECIFIC COMMENTS:

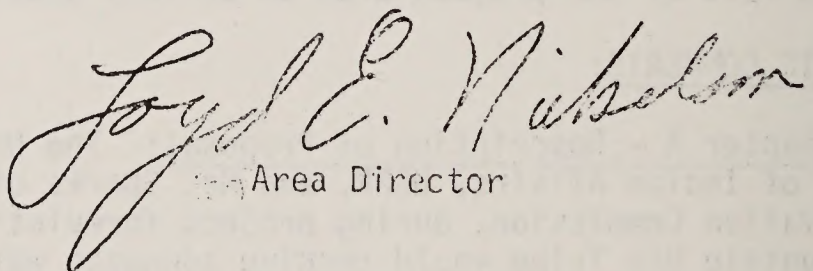
Chapter A - Description of Proposal: The Ute Mountain Ute Tribe, the Bureau of Indian Affairs, USBR, and Mr. Sparks of the Colorado Water Conservation Commission, during project formulation, jointly agreed that the Ute Mountain Ute Tribe would receive adequate water for full irrigation of 7,500 acres of land. The statement indicates this in general terms, but to eliminate any doubt or questions in this regard, it would be desirable to state this commitment to the Tribe in more definite terms. As stated in all previous correspondence, the Bureau of Indian Affairs does not agree that an adequate water supply is being allocated to irrigate 7,500 net acres of land on the Ute Mountain Ute Reservation.

Chapter C - Environmental Impacts of Proposed Action: Section 10 - Historical and Archaeological Sites, appears to be solely concerned with cultural resources to be impacted by project features. The statement D.3.b.(D-3) that "The University's survey identified 281 sites that would not be protected by Federal laws and regulations since they would continue to be on private property. The Bureau would encourage landowners to preserve these sites in the future and would offer technical assistance.", appears to recognize the fact that providing irrigation water to the lands on which these sites lie, may and probably will, result in the destruction of

these archeological sites. Therefore, it appears that the destruction of these archeological sites, through plowing and other agricultural activities, should be explicitly stated as a probable "indirect effect" of the proposed action.

Chapter D - Mitigating Measures and Air and Water Quality Aspects: We wish to point out that archeological sites on the Ute Mountain Ute Reservation lack the protection of Federal laws and regulations with regard to the non-Federally funded, licensed, or approved activities of the Tribe or its members.

Chapter H - Alternatives to the Proposed Plan: In Section I, general, it is stated, "that the USBK has investigated many alternatives in order to derive a plan that would economically serve the water needs of the area while producing the smallest environmental impact. Many of the alternatives were dismissed after cursory investigation because of physical reasons, such as geological risks or insufficient water supplies or because of economic reasons, such as high construction costs. It appears to this office that these discarded or dismissed alternatives should be included in the Statement or as part of the Appendix. For example, an alternative that was considered but not included in the statement, was utilizing the Montezuma Valley Irrigation System to deliver the Towaoc water to the north boundary of the Ute Mountain Ute Reservation. This alternative, if found feasible, would have eliminated a parallel canal system from McPhee Reservoir to near the north boundary of the Reservation. The reasons or reason why this and other alternatives were not found feasible would be helpful to everyone.


Area Director

March 7, 1977

Memorandum

To: Files

Subject: Response to Bureau of Indian Affairs Letter of December 23, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

Chapter A - Description of Proposal: The Ute Mountain Ute Tribe, the Bureau of Indian Affairs, USBR, and Mr. Sparks of the Colorado Water Conservation Commission, during project formulation, jointly agreed that the Ute Mountain Ute Tribe would receive adequate water for full irrigation of 7,500 acres of land. The statement indicates this in general terms, but to eliminate any doubt or questions in this regard, it would be desirable to state this commitment to the Tribe in more definite terms. As stated in all previous correspondence, the Bureau of Indian Affairs does not agree that an adequate water supply is being allocated to irrigate 7,500 net acres of land on the Ute Mountain Ute Reservation.

Response:

Irrigation water supplies for the 7,500 acres have been determined in the same manner as for all other project lands. Adequate consideration for climate, irrigation, cropping patterns, etc., has been made. These determinations have been reviewed and found acceptable by technicians of the Bureau of Reclamation and consultants of the Bureau of Indian Affairs.

2. Comment:

Chapter C - Environmental Impacts of Proposed Action Section 10--Historical and Archaeological Sites, appears to be solely concerned with cultural resources to be impacted by project features. The statement D.3.b.(D-3) that "The University's survey identified 281 sites that would not be protected by Federal laws and regulations since they would continue to be on private property. The Bureau would encourage landowners to preserve these sites in the future and would offer technical assistance.", appears to recognize the fact that providing irrigation water to the lands on which these sites lie, may and probably will, result in the destruction of these archaeological sites. Therefore, it appears that the destruction of these archaeological sites, through plowing and other agricultural activities, should be explicitly stated as a probable "indirect effect" of the proposed action.

Response:

The sites referred to above are not on project rights-of-way nor on the full or supplemental service lands and therefore are not expected to be directly affected. Although some indirect impacts could possibly occur because of increased access and human activity, they cannot be estimated.

3. Comment:

4. Chapter D - Mitigating Measures and Air and Water Quality Aspects:
We wish to point out that archaeological sites on the Ute Mountain Ute Reservation lack the protection of Federal laws and regulations with regard to the non-Federally funded, licensed, or approved activities of the Tribe or its members.

Response:

Section D-3.b. has been modified to indicate that the Ute Mountain Ute Tribe would maintain jurisdiction over archaeological sites located outside the project area on the reservation.

4. Comment:

Chapter H - Alternatives to the Proposed Plan: In Section 1, general, it is stated, "that the USBR has investigated many alternatives in order to derive a plan that would economically serve the water needs of the area while producing the smallest environmental impact. Many of the alternatives were dismissed after cursory investigation because of physical reasons, such as geological risks or insufficient water supplies or because of economic reasons, such as high construction costs. It appears to this office that these discarded or dismissed alternatives should be included in the Statement or as part of the Appendix. For example, an alternative that was considered but not included in the statement, was utilizing the Montezuma Valley Irrigation System to deliver the Towaoc water to the north boundary of the Ute Mountain Ute Reservation. This alternative, if found feasible, would have eliminated a parallel canal system from McPhee Reservoir to near the north boundary of the Reservation. The reasons or reason why this and other alternatives were not found feasible would be helpful to everyone.

Response:

When irrigation service to the Towaoc area was expanded from 1,500 to 7,500 acres, the original route planned through a portion of the Montezuma Valley Irrigation Company's system was no longer adequate to deliver the flow required. Several alignments through Montezuma Valley were compared to determine the best location for the Towaoc Canal. A direct route through the valley that would not involve the MVIC system was determined to be the least expensive.



United States Department of the Interior

IN REPLY REFER TO

BUREAU OF LAND MANAGEMENT

CO-922

COLORADO STATE OFFICE
ROOM 700, COLORADO STATE BANK BUILDING
1600 BROADWAY
DENVER, COLORADO 80202

1793

DEC 17 1976

Memorandum

To: Commissioner, U.S. Bureau of Reclamation, Washington, D.C.

From: State Director, BLM, Colorado

Subject: DES-76/44 - Dolores Project, Colorado

As requested in your memorandum of November 4, 1976, we are providing the following comments on the Dolores Project draft environmental statement. They are keyed to chapter or page number for consideration in preparation of the final environmental statement.

Summary Page - 4th Paragraph

Table A-14 indicates that streamflows capable of providing adequate water for floating will only be available 13 out of 46 years, based on historical flow records. Twenty-three years out of 46 normal years will be out of production. The Dolores Project will utilize only 13 out of 46 years for floating opportunities; without the project, 36 out of 46 years can be utilized. The statement should indicate that floating opportunities will be more predictable, scheduled, and organized, but not increased.

A. Description of the Proposal

A-2. Interrelationship With Other Projects, and Units. A clearer statement is needed to identify whether the 150,000 tons of salt was contributed to the San Juan River before or after the Dolores Project. If it was before the project, the amount of salt would increase.

A-28, first paragraph. Powerlines must conform to acceptable standards for raptors.

A-43. According to statements on this page, the draft environmental statement appears to be consistent with the ongoing BLM/FS jurisdictional land transfer. BLM would apparently administer project recreation facilities at Williams Draw (Bradfield Ranch Headquarters), Mountain Sheep Point, Slick Rock, Little GYP Valley, and Bedrock. The Forest Service would administer recreation facilities around McPhee Reservoir, Ferris Canyon, and Cabin Canyon, and also the Wildlife Mitigation lands west of McPhee Reservoir.

The draft environmental statement is not clear with respect to project effects



on white-water boating on the Dolores River. Data in Table A-14 indicates a monthly streamflow (with the project) of 50 second-feet for 23 out of 46 years, and 20 second-feet 10 out of 46 years. An estimate of the amount of streamflow required for a quality white-water boating experience in the Dolores River would be helpful in supporting narrative conclusions that white-water boating opportunities would increase with the project.

B. Description of the Environment

B-2, Geology. No mention is made of the presence of mining claims. If there are none, there should be a disclaimer.

Figure B-5, page 27. Migration routes are shown in the legend but none are defined on the map. The map should include migration routes.

B-25, Wildlife. There is no mention of Colorado State Division of Wildlife's desire to plant big horn sheep.

B-34, (7) Gamebirds. Chukars are either present or not, since a 600 bird population figure is cited. Their location must also be known.

B-35, (9) Raptors. Riparian habitat is referred to but not defined on the maps or in acres. The wildlife section would be improved if habitat types were mapped and tabulated by acres and miles, as was done in Table C-4, page C-15.

Falcons are mentioned in section (9) but only kestrel are identified. Prairie falcons should be included.

Wildlife section, Existing Environment, is one of the best reviewed to date.

B-37, History. The general Cultural Resource discussion seems adequate, but it is clear that historic resources have not been fully evaluated or inventoried. Only two sites are identified in the impact area and both are towns (McPhee and Big Bend). Big Bend should be looked at more closely. Consideration should be given to testing the site archeologically. There is no mention of historic resources along the river bottom. Working ranches should have been inventoried and then evaluated, along with other possible sites as mines, roads, historic homesteads. Compliance with E.O. 11593 is not yet complete. This can be corrected by using data and inventory the field archeologists can provide when they inventory the area. Historic resources can be recorded by the archeologists and make recommendations for those sites that need such treatment. Some sites can be evaluated off field forms while others will require on-site inspection and recordation.

It should further be noted that the Dominguez-Escalante Trail mentioned in this Chapter has been designated a study area for the National Trails System Act as passed in Congress and signed by the President on October 17, 1976, as Public

Law 94-527. This means that the trail will have to be studied and then a determination must be made as to its potential for inclusion in the National Trails System.

Archeology. A good inventory has been conducted. There is a good understanding of needs in this area.

B-42, Scenery, First Paragraph. The area that will be altered should be specifically addressed, e.g., scenery quality.

There is no mention of the future importance of the Escalante Ruins as a scenic overlook site into the river.

B-50, Recreation and Tourism. There is no mention of Escalante Ruins, which is a developed site.

One of the more important aspects on elements of the environmental statement is recreation and impacts of the dam on white-water floating. This is a controversial issue with numerous individuals and groups waiting to see how this was handled in the environmental statement. It is difficult to locate. Recreation doesn't even appear in the Table of Contents. For some reason, recreation is discussed as part of the Industrial Resource Base. Boater use figures (only discussed in Chapter A on Page 34) should be included in Chapter B.

Boater use figures utilized for the environmental statement were the best estimate at the time, based on average use prior to 1976. However, since the reporting date, it appears that use has increased considerably (utilizing 1976 estimates). This is undoubtedly due to increased exposure and publicity, resulting from Dolores Project, Wild and Scenic River Study, which increased interest in white-water boating in the western states, and outfitters looking for new areas.

What this means in numbers is an increase in boater days from 600 boater days (1975) to perhaps greater than 3000 in 1976. This is based on users checking in with BLM prior to their trips. We recognize that not all users are doing this. With spot checks to verify this use, we found more people to be on the river than we anticipated. An example is Memorial Day weekend in which 500 boater days were expected, while the spot checks showed approximately 1000 boater days.

This increase probably does not have any bearing on the numbers used in this report (A-34) since they are based on carrying capacity.

C. Impacts.

Mention is made of 175-foot towers at pumping plants. There is no mention of them in Chapter A.

No mention is made of the change from a river-pastoral landscape to a reservoir-scape as being negative in the eyes of many people.

Mention should be made of the loss of agricultural lands and of the relocation of 64 people. This relocation is discussed in Mitigation of Impacts.

The proposal indicates (Table A-14) that at present white-water boating is possible in normal and wet years. After the project would be completed, such boating would be possible only in wet years. This is an impact on recreation but is not mentioned here nor in subsequent chapters.

C-12 and 13. The projected fisherman use on the project streams and reservoirs seems too high. These figures would occur only if the project were near population centers.

e. Dawson Draw Reservoir. This lake is going to be maintained entirely by return irrigation water which will be high in both fertilizers and pesticides. The effects this may have on the fishery of the lake is not made clear. The former may cause algal blooms which lead to loss of habitat. The latter may be present to the extent of entering the food chain and becoming concentrated in trout species making them unfit to eat.

This portion of the Dolores River has been nominated as a Wild and Scenic River. No mention is made of this in the draft statement. It should be addressed, covering all the ramifications this will have on recreation and fishing use of the area.

C-14 to 18, Big Game. Explanation is needed on how big game numbers would remain unchanged. Compare carrying capacities in relation to mitigation, before and after development of the project.

C-20, e. Furbearers. The last sentence should state that concrete lined sections will not benefit wildlife, even though animals will escape. The amount of increased habitat for beaver and muskrat should be quantified.

C-21, i. Waterfowl. Fluctuating reservoirs do not create waterfowl nesting habitats. Total bird increases will occur only if nesting, feeding, and resting areas are created. This section needs to be clarified.

C-22, j. Raptors. The Great-horned owl should be included with the hawks as raptors impacted by removal of pinon-juniper woodland.

C-23, first paragraph. The last two sentences conflict with each other.

D. Mitigation of Impacts.

D-1, General. Add Endangered Species Act, Sikes Act, and Federal Land Management and Policy Act.

D-2. Previously, the 4150 acres were private land. Now they are referred to collectively as private and public land. Public lands cannot be used as a mitigative measure. Acquisition of land is not sufficient for wildlife. Include land treatment practices.

Mitigation of historical sites could consist of the following: First, a qualified historian or historical archeologist could inventory the project area for historic sites. Then, those sites that are of significance could be photographically recorded and excavated on a limited basis. Those sites that might qualify for the National Register would have to be recorded, using the HABS system, and excavated prior to destruction. Lesser sites should be recorded prior to loss. The two townsites should be recorded and the Town of Big Bend excavated and recorded by a qualified historical archeologist. These measures should provide adequate mitigation for loss of historic resources. In this way, 36 CFR 800 would be complied with. Mitigation for the Dominguez-Escalante Trail would be difficult. Possibly photographic recordation could be used along with archeologic salvage in the area.

The impacts are stated to be the loss of the two townsites along with five miles of the Dominguez-Escalante Trail. In addition, there will be numerous working ranches lost. In this section detailing mitigation, there are no provisions for these losses.

E. Unavoidable Adverse Impacts.

No mention is made of the loss of one kind of landscape and imposition of another.

The Statement might be improved by expanding the discussion of unavoidable adverse scenic effects on Page E-2. McPhee Reservoir draw-down will apparently result in a visible mud-flat adjacent to the Town of Dolores during portions of the year.

F. Short-Term and Long-Term Environmental Uses.

F-1. Short-Term Losses, last sentence. This statement is only partially accurate because water control will benefit white-water boaters only in wet years. See Table A-14.

H. Alternatives.

H-11, 4. Nondevelopment, first paragraph, last sentence. "... therefore minimally utilized." This is a gross misstatement. Current use is much greater than will result with the project (given no use management restrictions). Even with management use restrictions, there would be more use without the project.

With the project: Only 1 of 4 or 3 of 10 years will be floatable.

No use will occur during "normal years." (See Table A-14.)

Without the project: Currently, some use, although sometimes limited, occurs during normal years (23 of 46 years).

We appreciate the opportunity for input and hope these comments prove helpful in the preparation of the final environmental statement.

Charles W. Fischer
Active

cc: Director (260)
DM, Montrose

March 7, 1977

Memorandum

To: Files

Subject: Response to Bureau of Land Management Letter of December 17, 1976, on the Dolores Project Draft Environmental Statement

1. Comment:

Summary Page - 4th Paragraph

Table A-14 indicates that streamflows capable of providing adequate water for floating will only be available 13 out of 46 years, based on historical flow records. Twenty-three years out of 46 normal years will be out of production. The Dolores Project will utilize only 13 out of 46 years for floating opportunities without the project, 36 out of 46 years can be utilized. The statement should indicate that floating opportunities will be more predictable, scheduled, and organized, but not increased.

Response:

The statement has been modified to show that the project would have an adverse effect on the average annual boating opportunities, although the decreased opportunities that would be available could be predicted, scheduled, and grouped. The revised estimates of boating with and without the project have been added to Section B-12.f. and Section C-13.g. The information is also summarized in response to comment No. 5 below.

Table A-14 shows average monthly streamflows at McPhee Dam with and without the project. The table should not be construed as indicative of the number of years in which boating flows would be available. The revisions in the statement referred to above specify that boating flows (flows of 500 second-feet or above at McPhee Dam) would be available in 44 out of 46 years without the project and only 22 out of 46 years with the project.

2. Comment:

A-2. Interrelationship With Other Projects, and Units. A clearer statement is needed to identify whether the 150,000 tons of salt was contributed to the San Juan River before or after the Dolores Project. If it was before the project, the amount of salt would increase.

Response:

The salt load mentioned was based on conditions before the project. Since the McElmo Creek Unit has not been authorized for construction, however, its potential impact is not separately identified in the Final Environmental Statement but is included with cumulative impacts of potential developments still under study discussed in Section C-14.

3. Comment:

A-28, first paragraph. Powerlines must conform to acceptable standards for raptors.

Response:

A statement to specify that acceptable standards for the protection of raptors would be met has been added to Section A-6.d.(3).

4. Comment:

A-43. According to statements on this page, the draft environmental statement appears to be consistent with the ongoing BLM/FS jurisdictional land transfer. BLM would apparently administer project recreation facilities at Williams Draw (Bradfield Ranch Headquarters), Mountain Sheep Point, Slick Rock, Little GYP Valley, and Bedrock. The Forest Service would administer recreation facilities around McPhee Reservoir, Ferris Canyon, and Cabin Canyon, and also the Wildlife Mitigation lands west of McPhee Reservoir.

Response:

In addition to the recreation and wildlife mitigation areas around McPhee Reservoir, it appears the Forest Service would administer the first four recreation sites downstream from the reservoir: Dam Site, Ferris Canyon, Cabin Canyon, and Williams Draw. BLM would administer the four lower sites: Mountain Sheep Point, Slick Rock, Little GYP Valley, and Bedrock. The final decision, however, as to which agency would administer which specific site has not been made. Major factors that will determine the division line are the outcome of the Dolores River Wild and Scenic River Study and the BLM-Forest Service land exchange proposal being studied by the two agencies.

5. Comment:

The draft environmental statement is not clear with respect to project effects on white-water boating on the Dolores River. Data in Table A-14 indicates a monthly streamflow (with the project) of 50 second-feet for 23 out of 46 years, and 20 second-feet 10 out of 46 years. An estimate of the amount of streamflow required for quality white-water boating experience in the Dolores River would be helpful in supporting narrative conclusions that white-water boating opportunities would increase with the project.

Response:

Table A-14 is not intended to show the availability of white-water boating flows but only the flows in representative years. The Bureau's estimates of boating use have been revised since the draft environmental statement was prepared and it is now anticipated that the project would have significant adverse impacts on boating opportunities. As stated in

Section B-12.f., the existing opportunities are estimated at an average of 54.6 launching days annually over the 46-year study period, with only 2 years with no launching days. (A launching day is defined as the occurrence of flows of 500 second-feet or more at McPhee Dam site during April 15 through July 31.) Recreational use is estimated at an annual average of 2,805 boater days, about 70 percent of which occurs from May 21 through June 20. The most intensive use is during the Memorial Day weekend.

The project would reduce the average annual launching days to 23.9, as discussed in Section C.13.g., with 24 out of 46 years with no launching days. The corresponding impact on actual boating use could vary considerably. Reservoir operating criteria would be developed so that the launching days available during the high use period of May 21 to June 10 could be predicted, grouped, and scheduled in advance to encourage a high efficiency of use. Depending upon the success of this program the boater days could vary from 1,333 to 1,937, a decrease of between 31 and 53 percent from conditions without the project. Background information and basic assumptions used in these estimates are available in Bureau of Reclamation offices in Salt Lake City, Utah, and Durango, Colorado.

The amount of streamflow required for a white-water boating experience of good quality is at least partially a matter of personal opinion. To produce white water on the Dolores River, flows of 2,000 second-feet or more below McPhee Dam would probably be required. With increasing flows the boating would become more exciting. Boaters more interested in relaxation and sightseeing would probably prefer flows of less than 1,000 second-feet.

6. Comment:

B-2, Geology. No mention is made of the presence of mining claims. If there are none, there should be a disclaimer.

Response:

Most of the mining claims that would be affected by the Dolores Project are within the proposed McPhee Reservoir area. Complete information on the numerous unpatented claims in this area is not available; however most of these claims were staked for uranium and vanadium in the 1950's. At the present time, there is little evidence of any activity on the claims in this area.

7. Comment:

Figure B-5, page 27. Migration routes are shown in the legend but none are defined on the map. The map should include migration routes.

Response:

The migration routes have been added to the map.

8. Comment:

B-25, Wildlife. There is no mention of Colorado State Division of Wildlife's desire to plant big horn sheep.

Response:

The project area, because of its elevation, does not contain suitable habitat for the introduction of bighorn sheep. The Colorado Division of Wildlife analyzed the impacts of the project and in its report did not discuss any plans for reintroducing the species.

9. Comment:

B-34, (7) Gamebirds. Chukars are either present or not. Since a 600 bird population figure is cited, their location must also be known.

Response:

Section B-8.a.(7) on gamebirds has been modified to state that chukars are present. They are found in parts of McElmo and Yellow Jacket Canyons. This information was provided by the Colorado Division of Wildlife.

10. Comment:

B-35, (9) Raptors. Riparian habitat is referred to but not defined on the maps or in acres. The wildlife section would be improved if habitat types were mapped and tabulated by acres and miles, as was done in Table C-4, page C-15.

Response:

Riparian vegetation is described in Section B-7.a.(8) as occurring in narrow bands along streams in the area. These bands would be too small to be distinguishable on the small scale map used in the statement. The tabulation of habitats shown in Table C-4 could be moved to Chapter B, but it also serves an important function in analyzing the impacts of the project in Chapter C and therefore has been left in Chapter C.

11. Comment:

Falcons are mentioned in section (9) but only kestrel are identified. Prairie falcons should be included.

Response:

Section B-8.b(9) contains a discussion of raptors which are common in the project area. Species lists available in the Bureau's offices in Durango and Salt Lake City indicate that the prairie falcon is occasionally found in the area but is not common.

12. Comment:

B-37, History. The general Cultural Resource discussion seems adequate, but it is clear that historic resources have not been fully evaluated or inventoried. Only two sites are identified in the impact area and both are towns (McPhee and Big Bend). Big Bend should be looked at more closely. Consideration should be given to testing the site archeologically. There is no mention of historic resources along the river bottom. Working ranches should have been inventoried and then evaluated, along with other possible sites as mines, roads, historic homesteads. Compliance with E.O. 11593 is not yet complete. This can be corrected by using data and inventory the field archeologists can provide when they inventory the area. Historic resources can be recorded by the archeologists and make recommendations for those sites that need such treatment. Some sites can be evaluated off field forms while others will require on-site inspection and recordation.

Response:

As discussed in Section C-9.a., the Bureau of Reclamation submitted State Inventory Forms for both McPhee and Big Bend townsites as part of its consultation with the State Historical Preservation Officer. The office evaluated the sites, concluding that sufficient consideration had been given and that neither meets the criteria for eligibility to the National Register of Historic Places.

Reclamation's proposed salvage program as detailed in Section D-3.b. will include identification and evaluation of any archaeological and/or historical resources within the project area that have not as yet been studied.

13. Comment:

It should further be noted that the Dominguez-Escalante Trail mentioned in this Chapter has been designated a study area for the National Trails System Act as passed in Congress and signed by the President on October 17, 1976, as Public Law 94-527. This means that the trail will have to be studied and then a determination must be made as to its potential for inclusion in the National Trails System.

Response:

Section B-9.a. of the statement has been amended to show the status of the Dominguez-Escalante Trail.

14. Comment:

B-42, Scenery, First Paragraph. The area that will be altered should be specifically addresssed, e.g., scenery quality.

Response:

The information contained in the section on scenery, although broad enough to cover the entire project area, is also valid for the specific

sites that will be altered by the project. The information on scenery is presented in general terms and is intended to give an impression of the varied quality of scenery in the area.

15. Comment:

There is no mention of the future importance of the Escalante Ruins as a scenic overlook site into the river.

Response:

Section B deals with the present environment and not the conditions of the scenic environment in the future. The presence of the ruins and BLM's efforts and plans to develop them as part of the Bicentennial celebrations is mentioned in section B-12.f.

16. Comment:

B-50, Recreation and Tourism. There is no mention of Escalante Ruins, which is a developed site.

Response:

Mention has been added that the Escalante Ruin is a National Historic Landmark managed by BLM for the public.

17. Comment:

One of the more important aspects on elements of the environmental statement is recreation and impacts of the dam on white-water floating. This is a controversial issue with numerous individuals and groups waiting to see how this was handled in the environmental statement. It is difficult to locate. Recreation doesn't even appear in the Table of Contents. For some reason, recreation is discussed as part of the Industrial Resource Base. Boater use figures (only discussed in Chapter A on Page 34) should be included in Chapter B.

Response:

Recreation is now discussed under separate heading in Sections B-12.f., and C-13, and is listed in the table of contents. Boater use figures have been added to the discussion in Section B-12.f. (also see the response to comment No. 5 on pages I-18 and 19 for a discussion of existing boater use and estimated impacts).

18. Comment:

Boater use figures utilized for the environmental statement were the best estimate at the time, based on average use prior to 1976. However, since the reporting date, it appears that use has increased considerably (utilizing 1976 estimates). This is undoubtedly due to increased exposure and publicity, resulting from Dolores Project, Wild and Scenic River

Study, which increased interest in white-water boating in the western states, and outfitters looking for new areas.

What this means in numbers is an increase in boater days from 600 boater days (1975) to perhaps greater than 3,000 in 1976. This is based on users checking in with BLM prior to their trips. We recognize that not all users are doing this. With spot checks to verify this use, we found more people to be on the river than we anticipated. An example is Memorial Day weekend in which 500 boater days were expected, while the spot checks showed approximately 1,000 boater days.

This increase probably does not have any bearing on the numbers used in this report (A-34) since they are based on carrying capacity.

Response:

As pointed out on pages I-18 and 19 in response to comment No. 5, estimates of boating have been revised and now show about 2,805 average annual boater-days without the project and from 1,333 to 1,937 boater-days with the project.

19. Comment:

C. Impacts.

Mention is made of 175-foot towers at pumping plants. There is no mention of them in Chapter A.

Response:

Section A-6.d.(4) has been amended to show the height of the towers at the plumping plants.

20. Comment:

No mention is made of the change from a river-pastoral landscape to a reservoir-scape as being negative in the eyes of many people.

Response:

Since a moderately fluctuating reservoir would replace a river channel which is dry for extended periods in the late summer and early fall, it is perhaps excessively subjective to suggest that the Dolores River in its present condition would be preferred by most people. The surrounding landscape will remain predominately pastoral or rural in either case.

21. Comment:

Mention should be made of the loss of agricultural lands and of the relocation of 64 people. This relocation is discussed in Mitigation of Impacts.

Response:

Section C-13.f.(2) has been modified to show that the project facilities would remove 1,218 acres of dry cropland and 2,324 acres of irrigated land from production. In addition, project water would be used to irrigate 27,860 acres of land that is now dry farmed and 7,500 acres of land that is now undeveloped, resulting in a net increase of 33,036 acres of irrigated land and a total decrease of 29,078 acres of dry crop land. A discussion of the impacts upon 64 people in the reservoir basin and the 56 people in the proposed landfill area in the town of Dolores has been included in section C-13.b.

22. Comment:

The proposal indicates (Table A-14) that at present white-water boating is possible in normal and wet years. After the project would be completed, such boating would be possible only in wet years. This is an impact on recreation but is not mentioned here nor in subsequent chapters.

Response:

The project impacts on white-water boating have been revised considerably as a result of new information obtained during the review of the draft environmental statement. It is now estimated that the project would adversely affect boating, and discussions of these effects have been added to Sections C-13 and E-6. Sections A-6.f.(1) and D-3.d. have been expanded to include additional data on anticipated project operation for white-water boating, including predictions of snowmelt and scheduling of releases in anticipation of flood flows.

23. Comment:

C-12 and 13. The project fisherman use on the project streams and reservoirs seems too high. These figures would occur only if the project were near population centers.

Response:

These use figures, obtained from the U.S. Fish and Wildlife Service with the aid of the Colorado Division of Wildlife, are based on historic use of similar adjacent waters, surface acres of fisheries provided, and the type (species) of fish available. Human population data was not used to arrive at these estimates.

24. Comment:

e. Dawson Draw Reservoir. This lake is going to be maintained entirely by return irrigation water which will be high in both fertilizers and pesticides. The effects this may have on the fishery of the lake is not made clear. The former may cause algal blooms which lead to loss of habitat. The latter may be present to the extent of entering the food chain and becoming concentrated in trout species making them unfit to eat.

Response:

As stated in Section C-5.c.(1) there should be no significant increase of fertilizer and pesticide levels in return flows. Persistent pesticides associated with ill effects caused by food chain concentration are not presently used nor are they expected to be used in the future within the project area.

25. Comment:

This portion of the Dolores River has been nominated as a Wild and Scenic River. No mention is made of this in the draft statement. It should be addressed, covering all the ramifications this will have on recreation and fishing use of the area.

Response:

Sections A-3 and C-13.g. contain discussions of the proposed designation of the Dolores River to the National Wild and Scenic River system and the impact of the project on that proposal. Essentially, the project is expected to have a beneficial effect because of enhanced fish and wildlife habitat and recreation opportunities. This improvement, resulting from reservoir releases to maintain a live stream and the proposed recreation facilities, was recognized in the Wild and Scenic River study report. The environmental impacts of the river designation were evaluated in a final environmental statement (FES 76-56) prepared by the Bureau of Outdoor Recreation and the Forest Service. The analysis assumed that the Dolores Project was in place.

26. Comment:

C-14 to 18. Big Game. Explanation is needed on how big game numbers would remain unchanged. Compare carrying capacities in relation to mitigation, before and after development of the project.

Response:

U.S. Fish and Wildlife Service data indicate that the present carrying capacity within the wildlife mitigation areas can be increased by management (fencing to exclude livestock, chaining, reseeding, and construction of water retention structures) to a level which exceeds twice the carrying capacity of the lands to be inundated. Although short-term losses of big game would occur during construction, full development of the habitat potential on the wildlife mitigation areas would compensate for habitat lost to inundation and development, thereby avoiding long-term big game losses.

27. Comment:

C-20, e. Furbearers. The last sentence should state that concrete lined sections will not benefit wildlife, even though animals will escape. The amount of increased habitat for beaver and muskrat should be quantified.

Response:

This section of the statement did not state that concrete-lined canals would benefit furbearers, only that they would allow most furbearers to escape. Habitat with and without the project is quantified in Table C-4.

28. Comment:

C-21, i. Waterfowl. Fluctuating reservoirs do not create waterfowl nesting habitats. Total bird increases will occur only if nesting, feeding, and resting areas are created. This section needs to be clarified.

Response:

Section C-7.i. has been clarified to point out that McPhee and Monument Creek Reservoirs would not increase waterfowl nesting habitat, but that Dawson Draw Reservoir, with its stable shoreline, would provide habitat suitable for nesting by resident birds. All reservoirs would provide resting and feeding habitats.

29. Comment:

C-22, j. Raptors. The great-horned owl should be included with the hawks as raptors impacted by removal of pinon-juniper woodland.

Response:

The statement has been changed to indicate the impact of pinon-juniper removal on great-horned owls.

30. Comment:

C-23, first paragraph. The last two sentences conflict with each other.

Response:

The Bureau of Reclamation does not consider the sentences to be in conflict. One sentence states that there will be a loss of habitat that is impossible to replace. However, the quality of the riparian habitat downstream from McPhee Dam would be improved over its existing conditions. Thus the carrying capacity for nongame birds in the downstream reaches would be increased, offsetting to a degree the losses in reservoir basin and resulting in an insignificant loss as stated.

31. Comment:

D. Mitigation of Impacts.

D-1, General. Add Endangered Species Act, Sikes Act, and Federal Land Management and Policy Act.

Response:

These additions have been made in the final environmental impact statement.

32. Comment:

D-2. Previously, the 4150 acres were private land. Now they are referred to collectively as private and public land. Public lands cannot be used as a mitigative measure. Acquisition of land is not sufficient for wildlife. Include land treatment practices.

Response:

The 4,150 acres of mitigation lands recommended by the Fish and Wildlife Service and the Colorado Division of Wildlife are a combination of public and private lands. Land ownership has no bearing on the potential of a particular piece of land to mitigate wildlife losses. Mitigation of losses can only be achieved through development of the land be it public or private. As explained in Section A-6.f.(2), the wildlife mitigation areas would be developed and managed specifically for big game by such methods as seeding and fertilizing to increase the carrying capacity and prohibiting any uses which would detract from the value as wildlife habitat. The Forest Service, the Fish and Wildlife Service, the Colorado Division of Wildlife, and the Bureau of Reclamation are now formulating a detailed plan for the development and management of the areas.

33. Comment:

Mitigation of historical sites could consist of the following: First, a qualified historian or historical archeologist could inventory the project area for historic sites. Then, those sites that are of significance could be photographically recorded and excavated on a limited basis. Those sites that might qualify for the National Register would have to be recorded, using the HABS system, and excavated prior to destruction. Lesser sites should be recorded prior to loss. The two townsites should be recorded and the Town of Big Bend excavated and recorded by a qualified historical archeologist. These measures should provide adequate mitigation for loss of historic resources. In this way, 36 CFR 800 would be complied with. Mitigation for the Dominguez-Escalante Trail would be difficult. Possibly photographic recordation could be used along with archaeological salvage in the area.

Response:

The statement in section D-3b presents a mitigation proposal similar to the one suggested with two minor exceptions. The State of Colorado has not recommended that the town of Big Bend be excavated and excavation is not therefore planned. Excavation could, of course, be accomplished if in its review, the National Advisory Council so recommended. Mitigation for the Dominguez-Escalante Trail is not planned since no evidence of the trail exists in the project area. Only the general route of the expedition is known and that has been gained primarily from interpretation of the diary Escalante kept during the expedition.

34. Comment:

The impacts are stated to be the loss of the two townsites along with five miles of the Dominguez-Escalante Trail. In addition, there will be numerous working ranches lost. In this section detailing mitigation, there are no provisions for these losses.

Response:

The Bureau has not proposed any measures to mitigate these losses, and they are consequently included as unavoidable adverse effects in Section E. None of the sites is listed on the National Register of Historic Places, and the State Historic Preservation Officer has concluded that the two townsites are not eligible for inclusion. The Dominguez-Escalante Trail, as stated in section B-9.a., is being studied for possible inclusion in the National Trail System.

35. Comment:

E. Unavoidable Adverse Impacts.

No mention is made of the loss of one kind of landscape and imposition of another.

Response:

It is recognized in Chapter C-12 that the project would result in some permanent changes to the local landscape. The Bureau of Reclamation believes that evaluation of the changes would be subjective and would not be considered adverse by many people.

36. Comment:

The statement might be improved by expanding the discussion of unavoidable adverse scenic effects on Page E-2. McPhee Reservoir draw-down will apparently result in a visible mud-flat adjacent to the Town of Dolores during portions of the year.

Response:

As discussed in section A-6.a.(1), one of the purposes of the landfill area would be to prevent the occurrence of mud flats near the town during periods of drawdown.

37. Comment:

F. Short-Term and Long-Term Environmental Uses.

F-1. Short-Term Losses, last sentence. This statement is only partially accurate because water control will benefit white-water boaters only in wet years. See Table A-14.

Response:

As stated above in response to comment No. 5 (pages I-18 and 19), revised calculations show that the project would adversely affect boating by reducing the available flows and the statement has been revised accordingly.

38. Comment:

H-11, 4. Nondevelopment, first paragraph, last sentence. "... therefore minimally utilized." This is a gross misstatement. Current use is much greater than will result with the project (given no use management restrictions). Even with management use restrictions, there would be more use without the project.

With the project: Only 1 of 4 or 3 of 10 years will be floatable.

No use will occur during "normal years." (See Table A-14.)

Without the project: Currently, some use, although sometimes limited, occurs during normal years (23 of 46 years).

Response:

As discussed on pages I-18 and 19 in response to comment No. 5, the Bureau has revised its estimates to show existing boating at about 2,805 boater days annually and future use at 1,333 to 1,937 boater-days annually under project conditions. The revised estimates also show about 44 out of 46 years with boating flows without the project and only 21 out of 46 years with the project.



United States Department of the Interior

BUREAU OF MINES
2401 E STREET, NW.
WASHINGTON, D.C. 20211

December 16, 1976

DES 76/44

Memorandum

To: Commissioner of Reclamation

Through ^{copy} Assistant Secretary--Energy and Minerals *DEC 1 1976*

From: Director, Bureau of Mines

Subject: Draft environmental statement, Dolores Project, Colorado

We have reviewed the draft environmental statement for this project which includes construction of three reservoirs and two major water-conveyance systems, and would involve diversion of water from the Dolores River to the San Juan River Basin.

Adverse project impacts on mineral resources and on mineral resource recovery are adequately discussed on page C-1. Commercial deposits of sand and gravel at the proposed McPhee Reservoir site would be committed to the project. In addition, a natural gas storage well owned by People's Natural Gas Co., of Cortez is situated within the proposed McPhee Reservoir; this well would be capped and abandoned (page A-12).

The benefits offered by the proposed project do not appear to entail excessive commitments of mineral resources or undue adverse impacts on the mineral industry in Dolores and Montezuma Counties. Therefore, we have no objections or suggested revisions to this draft environmental statement.

Thank you for the opportunity to review this statement.

[Signature]
Thomas W. Feltus
Director



January 21, 1977

Memorandum

To: Files

Subject: Response to Bureau of Mines Letter of December 16, 1976,
in Dolores Project Draft Environmental Statement

The Bureau of Reclamation acknowledges the letter and appreciates the review of the Draft Environmental Statement.



United States Department of the Interior

BUREAU OF OUTDOOR RECREATION
WASHINGTON, D.C. 20240

IN REPLY REFER TO:

DES-76/44

DEC 14 1976

Memorandum

To: Commissioner of Reclamation

From: Director, Bureau of Outdoor Recreation

Subject: Draft Environmental Statement, Dolores Project, Colorado

We have reviewed the subject statement as requested in your memorandum of November 4, 1976, and submit the following comments:

General Comments

The Dolores Project will include development and construction of recreation facilities that are in accord with the Colorado State Comprehensive Outdoor Recreation Plan (SCORP) with the exception that the 1976 SCORP shows a surplus in recreation activity days for stream fishing and lake swimming in the project area (Colorado Planning Region 9).

The draft environmental statement acknowledges the presence of the Dominguez-Escalante Trail through the project area and indicates that the route's location can be interpreted from the Escalante diary. Therefore, the statement should describe how this trail will be impacted by the project and the measures that will be taken to protect and interpret the trail. On October 17, 1976, the Dominguez-Escalante Trail was designated for study as a potential addition to the National Trails System by P.L. 94-527.

There are some discrepancies between this environmental statement and the March 1976 Dolores Wild and Scenic River Study report. In view of the interrelationship of this project to the Dolores Wild and Scenic River Study in which the Bureau of Reclamation was an active participant, the following specific comments are provided for your consideration. If, in the completion of your environmental statement, there are any questions as to the status of the Dolores Wild and Scenic River report or its relationship to the Dolores Project, we would be pleased to assist you in any way possible.

Specific Comments

Description of the Proposal

Page A-2, first full paragraph, last line: "Rivers" should be changed to "River."

Page A-2: The final environmental statement on the Dolores Project should make reference to the final Dolores Wild and Scenic River Study report dated March 1976. Although this report is currently under review by the Office of Management and Budget, we anticipate that it will be released and submitted to the Congress in the near future.

Page A-7, second paragraph, "e. Recreation and Fish and Wildlife Developments," last sentence: It is implied that only access easements would be acquired along some sections of the Dolores River between McPhee Dam and Bradfield Ranch. If this is the case, we concur in the acquisition of access easements where needed. In addition, river-front lands in this segment should be protected through the acquisition of scenic easements. This will be consistent with the Dolores Wild and Scenic River Study (W&SR) report recommendations.

Page A-17: Will the boat ramp planned at McPhee Dam be constructed to accommodate reservoir drawdown of 25 to 50 feet? If so, this should be stated.

Page A-31, third paragraph: In the Dolores Wild and Scenic River report, a recreation development and river access site is proposed at Bradfield Ranch, an important staging area for float trips. The report also states this site should be developed as a part of the Dolores Project but, if it is not, it will still be needed. In this draft statement there is no reference to a Bradfield Ranch recreation site, but it does describe a proposed "Williams Draw" site (also see Figure A-14). Is this at or near the Bradfield Ranch bridge? If not, will it serve the needs of river floaters and other recreationists? Specific information on the relationship of these two sites would be helpful.

Page A-31, fourth paragraph, and Figure A-15: It is stated that the recreation sites named would have "picnic areas;" however, in Figure A-15, no picnic facilities are listed. This should be clarified.

Page A-31, last paragraph: It is stated that "the estimated boating days would average 2,580 annually, an increase of 1,320 days over anticipated use without the project." This does not agree with the Wild and Scenic River report dated December 1975, pages 40 and 41, which explains that between 1928 and 1973, boating opportunities "would have occurred (in) 10 fewer years" if McPhee Dam had been in place. The report goes on to say that "the effect of the Dolores Project will be to reduce boating opportunities during dry years and increase them

during wet years." The Wild and Scenic River report also states that "total numbers of boating days will be slightly reduced," although the predictability and grouping of boating days will be improved. The environmental statement should describe this situation in sufficient detail to avoid any confusion as to the impacts of project operation on downstream boating opportunities.

Page A-34, (2) Fish and Wildlife Development: Information is presented on the number of years (of 46 studied) that flows below the project, assuming McPhee Dam in place, would have been maintained at a minimum of 78, 50, and 20 cfs. In the draft statement the numbers of years are shown as 13, 23, and 10, respectively. These figures do not agree exactly with the data contained in the Wild and Scenic River report which were based on information given the Wild and Scenic River study team by the Bureau of Reclamation, Durango, Colorado, in 1975. We suggest these data be rechecked.

Page A-34, last paragraph: It is stated that 25-foot (access) easements should be acquired. Consideration should be given to obtaining consistency with the Wild and Scenic River report by recommending that an area of between 100 and 200 feet either side of river centerline be acquired for access. In addition, scenic easements should be proposed and estimated costs included in the final statement.

Environmental Impacts of Actions

Page C-33, Table C-10: Without the project, man days of fishing on the Dolores River below McPhee Dam are recorded as 0. Does this mean no fishing occurs or no data are available? This should be clarified.

At Hinderhill

for John Crutcher

January 21, 1977

Memorandum

To: Files

Subject: Response to Bureau of Outdoor Recreation Letter of December 14, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

The Dolores Project will include development and construction of recreation facilities that are in accord with the Colorado State Comprehensive Outdoor Recreation Plan (SCORP) with the exception that the 1976 SCORP shows a surplus in recreation activity days for stream fishing and lake swimming in the project area (Colorado Planning Region 9).

Response:

Region 9 encompasses a five county area of southwest Colorado and, as a whole, stream fishing demand is being met through the Colorado Division of Wildlife's stocking program. However, in the local area of the project, which is situated in the more arid extreme western part of the State and Region 9, there is a lack of stream fishing opportunity. Also, on a region and statewide basis stream fishing opportunities are on the decline because of water development and use.

Opportunities for swimming are only incidentally provided as part of project development.

2. Comment:

The draft environmental statement acknowledges the presence of the Dominguez-Escalante Trail through the project area and indicates that the route's location can be interpreted from the Escalante diary. Therefore, the statement should describe how this trail will be impacted by the project and the measures that will be taken to protect and interpret the trail. On October 17, 1976, the Dominguez-Escalante Trail was designated for study as a potential addition to the National Trails System by P.L. 94-527.

Response:

As described in Section C-10, McPhee Reservoir would inundate approximately 5 miles of the 1,800-mile route taken by the Dominguez-Escalante Expedition. Section B-9.a. reflects the status of the trail as a potential addition to the National Trail System. At present it is envisioned that provisions for the interpretation of the Dominguez-Escalante trail would be incorporated in project visitor and recreation facilities; however, detailed plans of how this would be accomplished have not been completed.

3. Comment:

Page A-2, first full paragraph, last line : "Rivers" should be changed to "River."

Response:

The change has been made as suggested.

4. Comment:

Page A-2: The final environmental statement on the Dolores Project should make reference to the final Dolores Wild and Scenic River Study report dated March 1976. Although this report is currently under review by the Office of Management and Budget, we anticipate that it will be released and submitted to the Congress in the near future.

Response:

The reference has been made as suggested.

5. Comment:

Page A-7, second paragraph, "e. Recreation and Fish and Wildlife Developments," last sentence; It is implied that only access easements would be acquired along some sections of the Dolores River between McPhee Dam and Bradfield Ranch. If this is the case, we concur in the acquisition of access easements where needed. In addition, river-front lands in this segment should be protected through the acquisition of scenic easements. This will be consistent with the Dolores Wild and Scenic River Study (W&SR) report recommendations.

Response:

The acquisition of easements and other land controls necessary to protect the river environment and provide public recreation in connection with a possible wild and scenic river designation would be the responsibility of the administering agencies (the Bureau of Land Management and the Forest Service). This is consistent with the draft report of the Dolores River Wild and Scenic River Study (pages 94-95), which recommends that "within one year after designation, the administrative agency is to prepare a management plan. In this management plan the necessary controls on land would be determined and any scenic or access easements necessary to protect the river environment would be obtained by the administrative agency."

6. Comment:

Page A-17: Will the boat ramp planned at McPhee Dam be constructed to accommodate reservoir drawdown of 25 to 50 feet? If so, this should be stated?

Response:

The recreation development plans for McPhee that were developed by the Forest Service took into account reservoir fluctuation. The boat ramps were planned accordingly and would allow public use with the drawdown of 25 to 50 feet.

7. Comment:

Page A-31, third paragraph: In the Dolores Wild and Scenic River report, a recreation development and river access site is proposed at Bradfield Ranch, an important staging area for float trips. The report also states this site should be developed as part of the Dolores Project but, if it is not, it will still be needed. In this draft statement there is no reference to a Bradfield Ranch recreation site, but it does describe a proposed "Williams Draw" site (also see Figure A-14). Is this at or near the Bradfield Ranch bridge? If not, will it serve the needs of river floaters and other recreationists? Specific information on the relationship of these two sites would be helpful.

Response:

The Williams Draw site is at the Bradfield Ranch bridge and is intended to serve as a major staging area for boating trips. It would also accomodate other recreational users and fishermen.

8. Comment:

Page A-31, fourth paragraph, and Figure A-15: It is stated that the recreation sites named would have "picnic areas;" however, in Figure A-15, no picnic facilities are listed. This should be clarified.

Response:

The sites would have picnic areas; Figure A-15 (which is numbered as A-14 in the Final Environmental Statement) has been corrected and now lists these areas.

9. Comment:

Page A-31, last paragraph: It is stated that "the estimated boating days would average 2,580 annually, an increase of 1,320 days over anticipated use without the project." This does not agree with the Wild and Scenic River report dated December 1975, pages 40 and 41, which explains that between 1928 and 1973, boating opportunities "would have occurred (in) 10 fewer years" if McPhee Dam had been in place. The report goes on to say that "the effect of the Dolores Project will be to reduce boating opportunities during dry years and increase them during wet years." The Wild and Scenic River report also states that "total numbers of boating days will be slightly reduced," although the predictability and grouping of boating days will be improved. The environmental statement should describe this situation in sufficient detail to avoid any confusion as to the impacts of project operation on downstream boating opportunities.

Response:

As discussed on pages I-18 and 19 in response to comment No. 5--revised Bureau estimates show an average demand use of 2,805 boater days under existing conditions and 1,333 to 1,957 boater-days without the project. Detailed discussions of boating and the project impact are located in Sections B.12.f and C-13.g.

10. Comment:

Page A-34, (2) Fish and Wildlife Development: Information is presented on the number of years (of 46 studied) that flows below the project, assuming McPhee Dam in place, would have been maintained at a minimum of 78, 50, and 20 cfs. In the draft statement the numbers of years are shown as 13, 23, and 10, respectively. These figures do not agree exactly with the data contained in the Wild and Scenic River report which were based on information given the Wild and Scenic River study team by the Bureau of Reclamation, Durango, Colorado, in 1975. We suggest these data be rechecked.

Response:

The figures referred to above are based upon the most recent Bureau of Reclamation estimates. The figures used for the Wild and Scenic River report were preliminary and have been superseded.

11. Comment:

Page A-34, last paragraph: It is stated that 25-foot (access) easements should be acquired. Consideration should be given to obtaining consistency with the Wild and Scenic River report by recommending that an area between 100 and 200 feet either side of river centerline be acquired for access. In addition, scenic easements should be proposed and estimated costs included in the final statement.

Response:

This concern has been addressed in response to question No. 5 on Page I-36.

12. Comment:

Page C-33, Table C-10: Without the project, man days of fishing on the Dolores River below McPhee Dam are recorded as 0. Does this mean no fishing occurs or no data are available? This should be clarified.

Response:

Fishermen use below Dolores is minimal due to low flows and almost nonexistent game fish populations. Fisheries inventories in this area revealed a single black bullhead, the only "gamefish" collected from four electrofishing stations below Dolores.



United States Department of the Interior

FISH AND WILDLIFE SERVICE

WASHINGTON, D.C. 20240

ADDRESS ONLY THE DIRECTOR,
FISH AND WILDLIFE SERVICE

In Reply Refer To:
FWS/EC

JAN 12 1977

Memorandum

To: Commissioner, Bureau of Reclamation
Acting Deputy Assistant
From: Director, U.S. Fish and Wildlife Service
Subject: Dolores Project, CO. - Review of Draft EIS (ER-76/44)

We have reviewed the subject draft EIS and believe the comments provided in the December 13 memorandum from our Salt Lake City Area Office are essentially correct. We believe it is necessary to assess cumulative impacts which will result from the many projects on the Colorado River since water quality changes and possible restriction of migration patterns may make it impossible for some endangered species to survive.

Since some of these Colorado River Projects are not yet under construction it seems advisable at this time to more fully evaluate possible alternatives which may be less harmful to endangered fish species, particularly the Colorado River squawfish and the humpback chub. We are preparing surveys of the Critical Habitat areas of these two species at this time and it would be prudent to hold any new construction in abeyance until these critical habitat areas have been delineated.

Attachment



January 21, 1977

Memorandum

To: Files

Subject: Response to Director, U.S. Fish and Wildlife Service letter of January 12, 1977, on Dolores Project Draft Environmental Statement

1. Comment:

We believe it is necessary to assess cumulative impacts which will result from the many projects on the Colorado River since water quality changes and possible restriction of migration patterns may make it impossible for some endangered species to survive.

Since some of these Colorado River Projects are not yet under construction it seems advisable at this time to more fully evaluate possible alternatives which may be less harmful to endangered fish species, particularly the Colorado River squawfish and the humpback chub. We are preparing surveys of the Critical Habitat areas of these two species at this time and it would be prudent to hold any new construction in abeyance until these critical habitat areas have been delineated.

Response:

Of the five authorized developments^{1/} scheduled for construction in 1977 pending compliance with the National Environmental Policy Act, only one, the Grand Valley Unit, is located near endangered fish habitat. That project, however, would not significantly alter fish habitat in the Colorado River. Major features of the other four projects are located considerable distances upstream of endangered fish populations.

The salinity changes that would result from these projects are not expected to affect the Colorado squawfish or the humpback chub. Average salinity levels in the Colorado River as far downstream as Lee's Ferry are projected to be less than 800 mg/l after construction of the five projects. The species in question have been recorded as living in areas with extensive variations in salinity levels. At the Colorado-Utah border in 1974, salinity levels in the Colorado River ranged from 339 mg/l to 1,300 mg/l with no apparent adverse effects on the endangered species in this area. Colorado squawfish and humpback suckers have also been successfully reared from egg stage to lengths of 10 to 12 inches at Willow Beach National Fish Hatchery in water with salinity levels greater than 800 mg/l.

^{1/} These developments include the Savery-Pot Hook, Fruitland Mesa, and Dolores Projects and the Grand Valley and Paradox Valley Units of the Colorado River Basin Salinity Control Project.

Specific habitat requirements for the endangered fish species found in the Colorado River and tributaries have yet to be identified. However, judging from presently known data, the five projects are not expected to affect these endangered fish species. Therefore the Bureau of Reclamation does not consider it in the public interest to delay construction of these projects until critical habitat areas are delineated.



United States Department of the Interior
FISH AND WILDLIFE SERVICE

AREA OFFICE COLORADO-UTAH
1426 FEDERAL BUILDING
125 SOUTH STATE STREET
SALT LAKE CITY, UTAH 84138
December 13, 1976

In Reply Refer To (ES)

Memorandum

To: Commissioner
Bureau of Reclamation
Washington, D.C.

From: Area Manager
Fish and Wildlife Service
Salt Lake City, Utah

Subject: Dolores Project, CO.-Review of Draft EIS (DES 76/44)

We have reviewed the subject draft and offer the following comments for inclusion in the final statement.

General

The potential impacts of the Dolores Project on resident fish and wildlife are adequately described in the DES. We believe, however, that the DES does not address the impacts on the endangered Colorado River squawfish and humpback chub from the small changes in water quality in the Colorado River, nor does it discuss the cumulative environmental impacts of the proposed development in concert with other participating Colorado River Storage Projects (CRSP). Although page A-2 points out that the Dolores Project interrelates with portions of the Colorado River Basin Salinity Control Program, it fails to reveal that the cumulative environmental impact of upper basin impoundments and the consumptive use of water upstream led to salinity problems at Imperial Dam.

The Fish and Wildlife Service has not been able to ascertain the impacts on endangered fishes from the small changes in water quality that will occur from many of the Colorado River Storage Projects, including Dolores, nor do we fully understand the habitat requirements for these fishes. We do know; however, that water developments on the main stem Green and Colorado Rivers have changed the water quality and to the detriment of these species.

Overall, we suspect that the cumulative impacts from major water developments in the basin may have a significant adverse impact on those endangered fishes and their habitat. Since there is a high probability that sections of the Yampa, Green, Gunnison and Colorado Rivers will ultimately be designated as critical habitat by the Secretary of the Interior pursuant to Section 7 of the Endangered Species Act of 1973, we believe the Bureau of Reclamation with the active participation of U.S. Geological Survey, Bureau of Land Management, and Fish and Wildlife Service, should develop a programmatic EIS covering all of the projects under the Colorado River Storage Act (about twenty participating projects). The programmatic should identify, analyze and discuss the cumulative environmental impacts the participating projects have had and would have on the Colorado River System and how they affect the habitat of the Colorado River squawfish and humpback chub. We also believe the programmatic should address the cumulative effects the associated land use changes will have on wildlife habitat in the upper basin.

Since all of the participating projects are authorized with a recommended plan, and since several of these projects are not under actual construction (Dolores, Dallas Creek, Fruitland Mesa, West Divide, San Miguel, Animas-LaPlata, Savery-Pot Hook, etc.) this would provide your agency with an excellent opportunity to develop the programmatic statement. We believe the programmatic should be completed prior to any additional construction so both the private and public sectors can understand the overall cumulative environmental impacts associated with these projects.

Based on the Council on Environmental Quality's September 16, 1976 memorandum to Federal agencies concerning recent Supreme Court opinions on NEPA, Kleppe V. Sierra Club 424 U.S. - 44 U.S.L.W. 5104 (U.S. June 28, 1976) and Flint Ridge Development V. Scenic Rivers Association 424 U.S. - 44 U.S.L.W. 4954 (U.S. June 24, 1976), the court seems to support our views concerning the comprehensive or programmatic statement approach. The September 16, 1976 memorandum outlines under what conditions comprehensive statements must be prepared, their scope, and what actions can proceed before a comprehensive statement is complete.

The principal points which emerge from the Kleppe V. Sierra Club opinion are: (1) comprehensive statements are necessary, among other circumstances on coherent Federal programs and on related Federal activities or concurrent proposals with cumulative environmental impacts; and (2) comprehensive statements should reflect consideration of future program-related activities, sequential steps or phases, or other proposals which may compound the effects of a present action.

Specific comments

Page A-3, Table A-1:

The specific use of the 1,600 acre-feet of water allocated to the Dolores Water Conservancy District and the Ute Mountain Ute Indian Tribe for fish and wildlife purposes should have the concurrence of the Colorado Division of Wildlife and U.S. Fish and Wildlife Service.

Page C-3, Table C-1:

The table of post-project stream flows shows Groundhog Creek as dry in August and September of a normal water year as compared to 50-60 cfs during the same months of a dry year. Even during a wet year, no post-project flows are shown for September. Under normal conditions is Groundhog Creek dry for nine months during the year? We believe that the table should be corrected or the above items be clarified in the text.

Page C-9, C-10:

The summary of impacts on page C-10 concludes that as salts are leached from project soils, the influence of the project on the water quality in the lower basin would be negligible. In addition, the section indicates that water quality in the San Juan River and Colorado River Basins would not be significantly affected by the increased use of fertilizers and pesticides on project lands. The important consideration in the summary, however, should be that the project through depletion and salt contributions will increase the salinity of the Colorado River at Imperial Dam by 9.4 mg/l at a cost of \$2,162,000 annually.

Page D-4, E-1

One unavoidable adverse effect (E-1) of the depleted flows and increased salinity at Imperial Dam is the necessity to expend additional funds for salinity control in the Colorado Basin (D-4). The Salinity Control Program will have adverse impacts of its own, including the destruction of some riparian vegetation, the loss of wildlife habitat at evaporation pond sites and the loss of water through evaporation.

The continued development of Upper Basin compact waters will necessitate additional salinity control. Therefore, we again urge the Bureau to consider the full magnitude of development it proposes for the Upper

Colorado Basin and evaluate it in a programmatic statement.

We appreciate the opportunity to review the draft statement and hope our comments have proved useful.

Mitchell C. Sheldon

March 7, 1977

Memorandum

To: Files

Subject: Response to Colorado-Utah Area Office, U.S. Fish and Wildlife Service Letter of December 13, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

The potential impacts of the Dolores Project on resident fish and wildlife are adequately described in the DES. We believe, however, that the DES does not address the impacts on the endangered Colorado River squawfish and humpback chub from the small changes in water quality in the Colorado River, nor does it discuss the cumulative environmental impacts of the proposed development in concert with other participating Colorado River Storage Projects (CRSP). Although page A-2 points out that the Dolores Project interrelates with portions of the Colorado River Basin Salinity Control Program, it fails to reveal that the cumulative environmental impact of upper basin impoundments and the consumptive use of water upstream led to salinity problems at Imperial Dam.

....we believe the Bureau of Reclamation with the active participation of U.S. Geological Survey, Bureau of Land Management, and Fish and Wildlife Service, should develop a programmatic EIS covering all of the projects under the Colorado River Storage Act (about twenty participating projects). The programmatic should identify, analyze and discuss the cumulative environmental impacts the participating projects have had and would have on the Colorado River System and how they affect the habitat of the Colorado River squawfish and humpback chub. We also believe the programmatic should address the cumulative effects the associated land use changes will have on wildlife habitat in the upper basin.

Since all of the participating projects are authorized with a recommended plan, and since several of these projects are not under actual construction (Dolores, Dallas Creek, Fruitland Mesa, West Divide, San Miguel, Animas-LaPlata, Savery-Pot Hook, etc.) this would provide your agency with an excellent opportunity to develop the programmatic statement. We believe the programmatic should be completed prior to any additional construction so both the private and public sectors can understand the overall cumulative environmental impacts associated with these projects.

Response:

See Section C-14.

2. Comment:

Page A-3, Table A-1:

The specific use of the 1,600 acre-feet of water allocated to the Dolores Water Conservancy District and the Ute Mountain Ute Indian Tribe for fish and wildlife purposes should have the concurrence of the Colorado Division of Wildlife and U.S. Fish and Wildlife Service.

Response:

Specific uses of the 1,600 acre-feet reserved for fish and wildlife would be determined by the District and the Tribe in consultation with the Colorado Division of Wildlife and U.S. Fish and Wildlife Service as required by the Fish and Wildlife Coordination Act.

3. Comment:

Page C-3, Table C-1:

The table of post-project stream flows shows Groundhog Creek as dry in August and September of a normal water year as compared to 50-60 cfs during the same months of a dry year. Even during a wet year, no post-project flows are shown for September. Under normal conditions is Groundhog Creek dry for nine months during the year? We believe that the table should be corrected or the above items be clarified in the text.

Response: The table has been corrected.

4. Comment:

Page C-9, C-10:

The summary of impacts on page C-10 concludes that as salts are leached from project soils, the influence of the project on the water quality in the lower basin would be negligible. In addition, the section indicates that water quality in the San Juan River and Colorado River Basins would not be significantly affected by the increased use of fertilizers and pesticides on project lands. The important consideration in the summary, however, should be that the project through depletion and salt contributions will increase the salinity of the Colorado River at Imperial Dam by 9.4 mg/l at a cost of \$2,162,000 annually.

Response:

The economic effects of both loading and depletion are also summarized in Section C-5.e.

5. Comment:

Page D-4, E-1

One unavoidable adverse effect (E-1) of the depleted flows and increased salinity at Imperial Dam is the necessity to expend additional funds for salinity control in the Colorado Basin (D-4). The Salinity Control Program will have adverse impacts of its own, including the destruction of some riparian vegetation, the loss of wildlife habitat at evaporation pond sites and the loss of water through evaporation.

Response:

It is true that water resource developments in the Upper Colorado River Basin require additional funds for salinity control in the Colorado River Basin. Authority for such expenditures has been provided by Congress in the Colorado River Basin Salinity Control Act of June 24, 1974 (Public Law 93-320).

The impacts of the Colorado program are discussed in the Final Environmental Statement for the Colorado River Water Quality Improvement Program which is scheduled for completion in 1977. Also see Section C-14.

6. Comment:

The continued development of Upper Basin compact waters will necessitate additional salinity control. Therefore, we again urge the Bureau to consider the full magnitude of development it proposes for the Upper Basin.

Response:

Development in the Upper Colorado River Basin comprises both Federal and non-Federal projects. Development of these projects is and will be constrained by the various laws governing the use of water including the Colorado River Compact and the Upper Colorado River Compact. Salinity control units will be constructed to alleviate the buildup of salinity in the lower river consistent with development of feasible plans for salinity control under Congressional authorization. Other methods such as vegetation management, watershed improvement, and weather modification or management will be necessary.



United States Department of the Interior

GEOLOGICAL SURVEY
RESTON, VIRGINIA 22092

OFFICE OF THE DIRECTOR

In Reply Refer To:
EGS-DES-76/44
Mail Stop 760

DEC 14 1976

Memorandum

To: Commissioner of Reclamation

Through: ^{Copy 76} Assistant Secretary--Energy and Minerals *Rolland R. Read*
DEC 15 1976

From: Director, Geological Survey

Subject: Review of draft environmental statement for Dolores Project,
Montezuma and Dolores Counties, Colorado

We have reviewed the subject draft environmental statement as requested in your memorandum of November 4.

It is noted that the proposed project calls for placement of 462,000 cubic yards of fill on a 45-acre area at the west edge of the town of Dolores in order to prevent backwash flooding of that area and the fill would require the displacement of 56 people in 21 homes (p. A-12 and A-15). We have found no mention of an alternative to this proposal. The elevation of the 45-acre landfill area with respect to the level of McPhee Reservoir cannot be determined from information in the draft environmental statement, in the absence of a topographic map of the project area. However, the stated requirement for 462,000 cubic yards of fill on a 45-acre area indicates that the area would be raised about six feet, on the average. Because that action would evidently have a significant environmental impact, it would be advisable to discuss the alternative of protecting that area by means of dikes, or to provide sufficient information to clarify why the placement of fill is preferable. In addition, we have not found any map showing the location of dikes along the Dolores River that would be raised (p. A-11, last par.), and consequently are uncertain how these dikes are situated with respect to the proposed landfill area.



Sanitary waste facilities (p. A-31 to A-34) within the area for recreational development should include disposal facilities for the holding tanks of boats in order to maintain the water quality of the McPhee reservoir and reaches of the Delores River downstream from the McPhee Dam.

The source of water supplies for the recreational sites should be indicated and the impact of use as a result of the increased visitation should be assessed.

Henry W. Coulter
Acting Director

January 21, 1977

Memorandum

To: Files

Subject: Response to U.S. Geological Survey letter of December 14, 1976,
on Dolores Project Draft Environmental Statement

1. Comment:

It is noted that the proposed project calls for placement of 462,000 cubic yards of fill on a 45-acre area at the west edge of the town of Dolores in order to prevent backwash flooding of that area and the fill would require the displacement of 56 people in 21 homes (p. A-12 to A-15). We have found no mention of an alternative to this proposal. The elevation of the 45-acre landfill area with respect to the level of McPhee Reservoir cannot be determined from information in the draft environmental statement, in the absence of a topographic map of the project area. However, the stated requirement for 462,000 cubic yards of fill on a 45-acre area indicates that the area would be raised about six feet, on the average. Because that action would evidently have a significant environmental impact, it would be advisable to discuss the alternative of protecting that area by means of dikes, or to provide sufficient information to clarify why the placement of fill is preferable. In addition, we have not found any map showing the location of dikes along the Dolores River that would be raised (p. A-11, last par.) and consequently are uncertain how these dikes are situated with respect to the proposed landfill area.

Response:

The top of the active capacity of McPhee Reservoir was established at an elevation of 6,924 after consideration of numerous related and important factors. These included the evaluation of sediment inflow and deposition, reservoir flood routing, spillway design, backwater studies, the location and design of State Highway 145 at Dolores, the location of the Dolores Cemetery, potential winter icing problems at the head of the reservoir, storm drainage within Dolores, the present flood protection levee, ground water conditions, estimated right-of-way costs, relocation costs, the elevation at which water should be delivered from the reservoir, total active reservoir capacity available for project use, and sizing of the project as related to needs of the area.

The area immediately downstream from Dolores ranges in elevation from 6,910 to about 6,930 feet and averages 6,920 feet. Two alternatives were given consideration in this area to minimize impacts on the town of Dolores. One alternative was to simply clear the area, provide surface drainage, and add some riprap protection in areas subject to erosion. This would not be costly, but the area would be intermittently inundated, subject to sediment deposition, difficult to revegetate, and of limited usefulness to the town of Dolores.

The construction of dikes at the lower end of the town was also considered, but this alternative would have the serious disadvantage of interfering with drainage within the town. The lower end of the town would still be subject to intermittent flooding. The dikes would also make it extremely difficult and expensive to control the seepage behind them.

Although more costly, filling this low area of the town would eliminate many of these problems. For instance, the landfill area is designed to be 2 feet higher than the top of the active capacity of McPhee Reservoir. The fill would be made of pervious, free draining material from the reservoir area downstream so as not to form a barrier to ground water movement through the town. The fill would be sloped to provide surface drainage and prevent ponding. The area would be landscaped and seeded and would be a useable area for the town of Dolores except during extreme flooding when the landfill area would be largely inundated. Another advantage is that the fill would keep the Dolores River in its natural channel and under the highway bridge at a sufficient velocity to greatly reduce sediment deposition in this area.

The existing dikes along the river channel would be raised to protect the town from a 100-year flood of 10,000 second-feet. The dike freeboard would range from 2 1/2 to 5 feet. The improved dike would follow the alignment of the existing dike from about 500 feet west of First Street to about Ninth Street, a distance of approximately 0.7 mile.^{1/} The dike would have a crest width of 20 feet, 2:1 side slopes, and riprap protection on the river side.

2. Comment:

Sanitary waste facilities (p. A-31 to A-34) within the area for recreational development should include disposal facilities for the holding tanks of boats in order to maintain the water quality of the McPhee reservoir and reaches of the Dolores River downstream from the McPhee Dam.

Response:

Disposal facilities for the boat holding tanks would be included in the recreation developments at McPhee Reservoir. Monument Creek and Dawson Draw Reservoirs, however, would be restricted to small boats that do not have holding tanks.

3. Comment:

The source of water supplies for the recreational sites should be indicated and the impact of use as a result of the increased visitation should be assessed.

^{1/} This lower end of the dike would blend with the landfill upstream of Highway 145 bridge a few hundred feet so as not to form a drainage barrier at the lower part of town.

Response:

Water for the recreation sites would be obtained from the reservoir at which they were located, either by pumping directly or by drilling wells and pumping from bank storage. Water from the river would be used at the recreation areas downstream from McPhee Dam. Treatment facilities would be provided at each site and would meet applicable standards for drinking water.



United States Department of the Interior

NATIONAL PARK SERVICE
WASHINGTON, D.C. 20240

IN REPLY REFER TO:

DEC 15 1976

L7619 (RMR)CS

Memorandum

To: Commissioner, Bureau of Reclamation

Through: Assistant Secretary for Fish and Wildlife and Parks

From: Assistant Director

Subject: Draft Environmental Statement - Dolores Project,
Colorado (DES 76-44)

As requested in your memorandum of November 4, 1976, we have reviewed the subject statement and offer the following comments.

We note references on pages B-39 and C-25 to the National Register of Historic Places. The final environmental statement should establish consultation of the most current listing as published in the Federal Register of February 10, 1976, and all monthly supplements.

From page B-39, as well, we note that there has been consultation with the State Historic Preservation Officer and that the Bureau of Reclamation has correspondence of July 7, October 7, and November 21, 1975, from the State Historical Society of Colorado on file. We suggest that the final environmental statement include the State Historic Preservation Officer's comments concerning this project and copies of all other related correspondence cited above. There is a need to establish that the development proposals will not affect any cultural resource site which may be in the process of nomination to the National Register.

The draft environmental statement does address in part our concern with regard to the protection of cultural resources. However, it does appear entirely possible that the present document underestimates the potential serious impact upon many archeological sites. More times than not, such mitigative measures, as are taken where there are project developments of such major scope, fall far short of the ideal.



Accordingly, we consider it appropriate to offer some further reflective comments for consideration in assessing total project development impacts on cultural resources, and more particularly, archeological sites.

Inasmuch as 459 archeological/historical sites have been identified in the project area, and such remains comprise a limited nonrenewable resource which is constantly diminishing, any action which further reduces this resource is irreversible, cumulative and irretrievable. No mitigating measures or studies lessen these commitments; primarily because they, in themselves, represent a commitment of the resources. With this point of commitment in mind, we believe that the draft environmental statement does not thoroughly address several major concerns.

A major Federal action such as the Dolores Project, which will result in disturbance of the natural surface of the land and change the existing use of the land by construction, will unquestionably destroy resources which have potential for providing significant information not likely to be duplicated elsewhere. This action may also cause a loss in aggregate of sites that are representative of a sample or pattern of culture. Until an intensive field testing survey has been accomplished, a sufficient research design to properly assess the scientific value of these resources cannot be produced, nor can a good evaluation of their significance be made.

The scientific value of the sites identified will depend largely on the degree to which they constitute a representative sample of culture in a regional context, and the potential they have in establishing reliable generalizations about the past culture. To this end, the statement should further address intensive survey plans and the formulation of a research design which will further assess the relative abundance of the resources, the degree to which specific sites represent chronological periods of culture, and the degree to which they are confined to the project area. The assessment should also address the cultural and environmental relationships of resources within the project area to the surrounding culture province. In short, we believe that there is a broad range of research topics to which investigation and/or preservation of the resources may contribute in filling the voids and deficiencies in current knowledge.

There are some indirect implications of the proposed action with regard to the acquisition of additional data concerning man's past. Obviously, scientific investigations and their results produce refinements in the state of the art, produce educational and research opportunities, professional training and professional training activities, not to mention salaries and associated economic benefits for those employed. Attendant to these matters are the acquisition of archeological artifacts and structures with potential for public exhibit and the expansion of tourism resulting from the development of such exhibits.

Without intensive testing survey, total data recovery costs cannot be calculated. Within the parameters of current technology, large pueblo sites are extremely expensive to salvage, study and publish. All estimates should include data analysis and publication costs, as these are matters which are too frequently not given weighted consideration.

The statements that archeological studies are planned do not in themselves constitute statements of negative or mitigating impact. Provisions for archeological study have built in constraints in terms of time and funding limitations, and these effect the degree to which studies mitigate adverse effects. Forced study obviously precludes the use of advanced research techniques at a future time and therefore constitute unavoidable effects. The draft environmental statement should address this situation in quantitative terms and show the costs of unavoidable adverse effects as the difference between the cost of mitigation and the cost of total recovery.

The draft environmental statement does not address archeological/historical resources in the alternatives section. Each alternative to the proposed actions should evaluate impact on archeological resources, the significance of those resources, the recovery and/or mitigation costs, and the comparative effects of all alternatives. If one alternative is selected over another, and it involves major destruction of archeological resources, the basis for choosing the alternative should be stated.

Raymond L. Freeman

March 7, 1977

Memorandum

To: Files

Subject: Response to National Park Service letter of December 15, 1977
on Dolores Project Draft Environmental Statement

1. Comment:

We note references on pages B-39 and C-25 to the National Register of Historic Places. The final environmental statement should establish consultation of the most current listing as published in the Federal Register of February 10, 1976, and all monthly supplements.

Response:

The most current listings as cited have been consulted as noted in Sections B-9.b and C-10.

2. Comment:

From page B-39, as well, we note that there has been consultation with the State Historic Preservation Officer and that the Bureau of Reclamation has correspondence of July 7, October 7, and November 21, 1975, from the State Historical Society of Colorado on file. We suggest that the final environmental statement include the State Historic Preservation Officer's comments concerning this project and copies of all other related correspondence cited above. There is a need to establish that the development proposals will not affect any cultural resource site which may be in the process of nomination to the National Register.

Response:

The referenced correspondence pertains to the town sites of McPhee and Big Bend, which have been determined to be not eligible for nomination to the National Register of Historic Places. As detailed in Section C-10, the project will affect archaeological sites that may be eligible for nomination to the National Register.

The Bureau of Reclamation is developing a plan to identify and nominate eligible sites to the National Register. A plan is also being developed to mitigate any project impacts on archaeological and historic resources. This plan is being developed in consultation with the State Historic Preservation Officer and the Advisory Council on Historic Preservation.

3. Comment:

Inasmuch as 459 archeological/historical sites have been identified in the project area, and such remains comprise a limited nonrenewable resource which is constantly diminishing, any action which further reduces

this resource is irreversible, cumulative and irretrievable. No mitigating measures or studies lessen these commitments; primarily because they, in themselves, represent a commitment of the resources. With this point of commitment in mind, we believe that the draft environmental statement does not thoroughly address several major concerns.

Response:

Sections C-10 and G have been revised to contain a more detailed analysis of the loss of archaeological sites, including the commitments resulting from the proposed testing and excavation program.

4. Comment:

A major Federal action such as the Dolores Project, which will result in disturbance of the natural surface of the land and change the existing use of the land by construction, will unquestionably destroy resources which have potential for providing significant information not likely to be duplicated elsewhere. This action may also cause a loss in aggregate of sites that are representative of a sample or pattern of culture. Until an intensive field testing survey has been accomplished, a sufficient research design to properly assess the scientific value of these resources cannot be produced, nor can a good evaluation of their significance be made.

Response:

As described in Section B-9.b, intensive field surveys have been conducted within the project area that have identified 592 sites. An assessment of their significance is underway and any sites eligible will be nominated to the National Register of Historic Places.

5. Comment:

The scientific value of the sites identified will depend largely on the degree to which they constitute a representative sample of culture in a regional context, and the potential they have in establishing reliable generalizations about the past culture. To this end, the statement should further address intensive survey plans and the formulation of a research design which will further assess the relative abundance of the resources, the degree to which specific sites represent chronological periods of culture, and the degree to which they are confined to the project area. The assessment should also address the cultural and environmental relationships of resources within the project area to the surrounding culture province. In short, we believe that there is a broad range of research topics to which investigation and/or preservation of the resources may contribute in filling the voids and deficiencies in current knowledge.

Response:

Table B-6 details the cultural relationships of the sites located and places them in chronological periods relevant to the Basketmaker-Pueblo

sequence. The available information is being used to develop a research program that is directed toward retrieving as broad a spectrum of information as possible.

6. Comment:

There are some indirect implications of the proposed action with regard to the acquisition of additional data concerning man's past. Obviously, scientific investigations and their results produce refinements in the state of the art, produce educational and research opportunities, professional training and professional training activities, not to mention salaries and associated economic benefits for those employed. Attendant to these matters are the acquisition of archeological artifacts and structures with potential for public exhibit and the expansion of tourism resulting from the development of such exhibits.

Response:

The Bureau concurs with these observations. The information obtained from research in the project area would be made available for public and professional use. The historical and archaeological resources would be exhibited and interpreted as part of the overall plan for recreational development.

7. Comment:

Without intensive testing survey, total data recovery costs cannot be calculated. Within the parameters of current technology, large pueblo sites are extremely expensive to salvage, study and publish. All estimates should include data analysis and publication costs, as these are matters which are too frequently not given weighted consideration.

Response:

Total data recovery does not yet appear to be an achievable or realistic approach in dealing with archaeological and historic resources. In accordance with the Reservoir Salvage Act of 1960, as amended in 1974 (P.L. 93-291), up to 1 percent of the total project cost may be used to properly mitigate the impact on cultural resources. Within this restriction, it has been estimated that an adequate research program could be undertaken. Such a program would include data analysis and publication.

8. Comment:

The statements that archeological studies are planned do not in themselves constitute statements of negative or mitigating impact. Provisions for archeological study have built in constraints in terms of time and funding limitations, and these effect the degree to which studies mitigate adverse effects. Forced study obviously precludes the use of advanced research techniques at a future time and therefore constitute unavoidable

effects. The draft environmental statement should address this situation in quantitative terms and show the costs of unavoidable adverse effects as the difference between the cost of mitigation and the cost of total recovery.

Response:

Section C-10 contains a discussion recognizing that the proposed archaeological studies would in themselves represent a commitment of archaeological resources. These studies are considered to be a mitigation measure only in the sense that they would obtain as much information as possible from the sites. The Bureau is not aware of any method to measure the cost of the unavoidable adverse effect in monetary terms, particularly since the cost of total data recovery would be based upon advance research techniques that have not yet been devised.

9. Comment:

The draft environmental statement does not address archeological/historical resources in the alternatives section. Each alternative to the proposed actions should evaluate impact on archeological resources, the significance of those resources, the recovery and/or mitigation costs, and the comparative effects of all alternatives. If one alternative is selected over another, and it involves major destruction of archeological resources, the basis for choosing the alternative should be stated.

Response:

Chapter H of the statement has been revised to include a summary of the estimated impacts on archaeological resources for each alternative. The effects could not be evaluated in the same detail as for the proposed plan, but the analysis permits a comparison of the plans. Several of the alternatives contain essentially the same features as the proposed plan, and it may be reasonably assumed they would have similar recovery and mitigation costs. If any of the alternatives were selected in favor of the proposed plan, new rights-of-way and other affected land areas would be thoroughly inventoried to assess the significance of the resource and to determine an appropriate mitigation plan.

Advisory Council on
Historic Preservation
1522 K Street N.W.
Washington, D.C. 20005

December 3, 1976

Mr. G. G. Stamm
Commissioner
Bureau of Reclamation
Department of the Interior
Washington, D. C. 20240

Dear Mr. Stamm:

This is in response to your request of November 4, 1976, for comments on the draft environmental statement for the Dolores Project, Montezuma and Dolores Counties, Colorado. The Advisory Council has reviewed the statement and notes that the undertaking will affect numerous archeological and historical resources, properties listed on or eligible for listing on the National Register of Historic Places.

Until the requirements of Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320) are met, the Council considers the draft environmental statement to be inadequate in that its treatment of historical, archeological, and cultural resources is incomplete. To remedy this deficiency, the Council will provide substantive comments on the undertaking's effect on the previously mentioned properties through the steps detailed in the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800).

For the Bureau of Reclamation's information, the preliminary case report prepared pursuant to Sections 800.4(f) and 800.5 of the Council's "Procedures" should detail the following information:

1. a general description of the proposed undertaking with explanatory graphic material;
2. a description of the properties included in or eligible for inclusion in the National Register to be affected by the undertaking, identifying the significant features of the properties;
3. an evaluation of the effect of the undertaking upon the properties included in or eligible for inclusion in the National Register;

The Council is an independent unit of the Executive Branch of the Federal Government charged by the Act of October 15, 1966 to advise the President and Congress in the field of Historic Preservation.

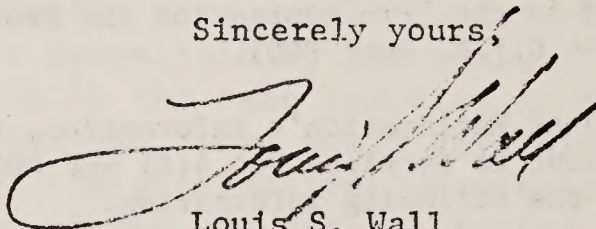
Page 2
December 3, 1976
Mr. G. G. Stamm
Dolores Project

4. an outline of measures taken in considering the undertaking's effect upon the properties included in or eligible for inclusion in the National Register, including:
 - a. an expression of the views of the State Historic Preservation Officer,
 - b. an indication of the support or opposition of units of government, as well as public and private agencies and organizations,
 - c. a review of alternatives that would avoid any adverse effects, and
 - d. a review of alternatives that would mitigate any adverse effects.
5. the status of this project in your agency's approval process.

Please contact Brit Allan Storey of the Council's Denver staff to assist you in completing this process as expeditiously as possible. He can be reached at (FTS) 234-4946 or P. O. Box 25085, Denver, Colorado 80225.

Thank you for your cooperation in this matter.

Sincerely yours,



Louis S. Wall
Assistant Director, Office
of Review and Compliance

January 21, 1977

Memorandum

To: Files

Subject: Response to Advisory Council on Historic Preservation letter of December 3, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

Until the requirements of Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320) are met, the Council considers the draft environmental statement to be inadequate in that its treatment of historical, archeological, and cultural resources is incomplete. To remedy this deficiency, the Council will provide substantive comments on the undertaking's effect on the previously mentioned properties through the steps detailed in the "Procedures for the Protection of Historic and Cultural Properties" (36 C.F.R. Part 800).

Response:

As indicated in Section D-3.b., the Bureau of Reclamation is in the process of developing the necessary information to request comments from the Advisory Council on Historic Preservation pursuant to the provision of Section 106 of the National Historic Preservation Act of 1966 (16 U.S.C. 470f, as amended, 90 Stat. 1320). The Bureau will undertake no actions that would affect the existing resources in the proposed project area prior to completion of consultation with the council and receipt of its comments.



DEPARTMENT OF AGRICULTURE
OFFICE OF THE SECRETARY
WASHINGTON, D. C. 20250

December 8 1, 1971

Mr. Gilbert G. Stamm
Commissioner
Bureau of Reclamation
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Stamm:

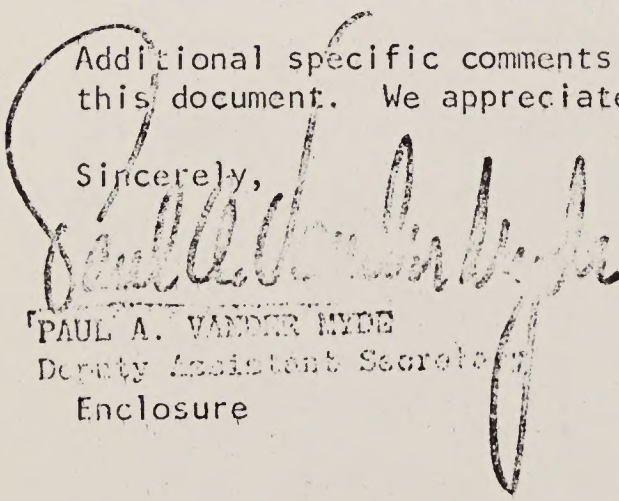
This is in response to a letter of November 4, 1976, from Mr. D. D. Anderson, Acting Commissioner, requesting our review of the draft environmental statement for the Dolores Project, Colorado. The subject statement addresses anticipated impacts involved in the construction of three reservoirs and two major water conveyance systems within the Upper Colorado River Basin, in Montezuma and Dolores Counties, Colorado. The Dolores Project would provide 126,000 acre-feet of water annually for irrigation of 26,300 acres of supplemental-service land and 35,360 acres of full-service land, as well as for municipal and industrial use and fish and wildlife enhancement.

The final environmental statement should recognize the technical assistance available from the U.S. Department of Agriculture's Soil Conservation Service, through Soil Conservation Districts, to landowners in applying conservation practices. Onfarm irrigation practices should be recognized for their water conservation benefits as well as their effectiveness in reducing the pollution potential of irrigation return flows. Application of these practices is one of the most feasible means to deal with environmental pollutants associated with irrigated agriculture.

We also suggest that the projected consequences noted in the document entitled, "Forest Service Multiple Use Survey Report," dated December 1971, be recognized in the final statement.

Additional specific comments are enclosed for your use in finalizing this document. We appreciate the opportunity to review this document.

Sincerely,


PAUL A. VANDER MYDE

Deputy Assistant Secretary

Enclosure

U.S. Department of Agriculture
Comments on Draft Environmental Statement

Bureau of Reclamation
Dolores Project, Colorado

1. Page B-25, Big Game Mammals - Discussion of mule deer does not bring out the fact that a resident population, as well as a migrant population, uses the lower project areas.
2. Page B-30, Black Bear - The upper and lower limits of the population estimate, as stated, are so far apart as to offer little or no real information on bear density. The upper limit of 464 should be rounded to be commensurate with the degree of accuracy of the estimate.
3. Page B-49, bottom paragraph - Visitor days should be defined--if it is not--the reader will likely assume that it means the same as man-days fishing, as on page C-12. A visitor day is recreation use which aggregates to 12 person hours.
4. Page C-12, McPhee Reservoir - The "excellent growth rates" are typical only of the first few years (3-5) following the initial filling. A large sucker population will likely develop.
5. Page C-17, second paragraph - The statement is made, "... deer habitat would be beneficially affected by the acquisition of 420 acres of private land on the east side of McPhee Reservoir." This should state that the habitat would be protected by easements rather than by acquisition which suggests purchase.
6. Page C-24, Threatened or Endangered Species - The estimate of 50,000 acres of, "active prairie dog habitat," appears to be too high.
7. Pages C-26 and C-29 - The increased employment, income, and population directly related to the new recreation resource should be described here. This will be a significant impact considering what has happened at other reservoirs.
8. Page C-32, Under recreation, the visits are described as man-days, whereas, on A-31 they were described as recreation days. The terminology should be consistent.
9. Page C-33, Fishing use estimates appear high. A total of 175,000 man-days of use with the project would be more than a sevenfold increase. This would indicate drawing fishermen from other Bureau of Reclamation reservoirs, thereby, reducing their use.
10. Section D - Mitigating Measures - There is no discussion of where or how sewage from the new recreation sites would be treated.
11. Attachment 1 should be carefully edited to insure that the correct values and appropriate reporting units have been recorded.

March 7, 1977

Memorandum

To: Files

Subject: Response to U.S. Department of Agriculture letter of December 21, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

The final environmental statement should recognize the technical assistance available from the U.S. Department of Agriculture's Soil Conservation Service, through Soil Conservation Districts, to landowners in applying conservation practices. Onfarm irrigation practices should be recognized for their water conservation benefits as well as their effectiveness in reducing the pollution potential of irrigation return flows. Application of these practices is one of the most feasible means to deal with environmental pollutants associated with irrigated agriculture.

Response:

In Section A-5-c of the statement, it has been added that the Soil Conservation Service offers valuable technical assistance in water conservation and in reducing the pollution potential of irrigation return flows.

2. Comment:

We also suggest that the projected consequences noted in the document entitled, "Forest Service Multiple Use Survey Report," dated December 1971, be recognized in the final statement.

Response:

The above mentioned document has been added to the bibliography in Section I of the statement.

3. Comment:

Page B-25, Big Game Mammals - Discussion of mule deer does not bring out the fact that a resident population, as well as a migrant population, uses the lower project areas.

Response:

A statement has been added to Section B-8.b.(2)(a) of this final statement to clarify this oversight.

4. Comment:

Page B-30, Black Bear - The upper and lower limits of the population estimate, as stated, are so far apart as to offer little or no real

information on bear density. The upper limit of 464 should be rounded to be commensurate with the degree of accuracy of the estimate.

Response:

New data have been received from the Colorado Division of Wildlife and the bear population is now estimated at 275.

5. Comment:

Page B-49, bottom paragraph - Visitor days should be defined--if it is not--the reader will likely assume that it means the same as man-days fishing, as on page C-12. A visitor day is recreation use which aggregates to 12 person hours.

Response:

The Bureau recognizes the above definition and has added an explanatory footnote.

6. Comment:

Page C-12, McPhee Reservoir - The "excellent growth rates" are typical only of the first few years (3-5) following the initial filling. A large sucker population will likely develop.

Response:

A qualifying statement has been added in Section C-6.b.

7. Comment:

Page C-17, second paragraph - The statement is made, ". . . deer habitat would be beneficially affected by the acquisition of 420 acres of private land on the east side of McPhee Reservoir." This should state that the habitat would be protected by easements rather than by acquisition which suggests purchase.

Response:

The statement referred to has been eliminated in the Final Statement as the project plan has been revised to provide for the acquisition of land or land rights to protect deer habitat around McPhee Reservoir. The impact of the acquisition is discussed in Section C-7.d(1).

8. Comment:

Page C-24, Threatened or Endangered Species - The estimate of 50,000 acres of, "active prairie dog habitat," appears to be too high.

Response:

This estimate was obtained from aerial reconnaissance of the area and is considered to be as accurate as could be obtained without an intensive ground survey.

9. Comment:

Pages C-26 and C-29 - The increased employment, income, and population directly related to the new recreation resource should be described here. This will be a significant impact considering what has happened at other reservoirs.

Response:

Approximately 9 man-years of employment would be directly generated annually by the operation, maintenance, and repair of new recreation resources. Almost all of these positions would be of a highly seasonal nature. The operation activities would generate more than \$77,000 annually in local salaries following project construction. No significant population influx is expected to be caused because of the seasonal nature of this employment. Directly related impacts have been added to the appropriate sections of this Final Statement.

10. Comment:

Page C-32, Under recreation, the visits are described as man-days, whereas, on A-31 they were described as recreation days. The terminology should be consistent.

Response:

The term man-days has been corrected to recreation days in the Final Statement.

11. Comment:

Page C-33, Fishing use estimates appear high. A total of 175,000 man-days of use with the project would be more than a sevenfold increase. This would indicate drawing fishermen from other Bureau of Reclamation reservoirs, thereby, reducing their use.

Response:

Fishing use was estimated by the Fish and Wildlife Service on the basis of the average surface area of the reservoirs, stocking rates, and the use of existing reservoirs in the vicinity.

12. Comment:

Section D - Mitigating Measures - There is no discussion of where or how sewage from the new recreation sites would be treated.

Response:

While detailed engineering and designs have not been completed, the general plan is that major developments would have flush toilets and sewage lagoons. Smaller recreation sites would have leak-proof vaults, and sewage would be pumped or hauled to the lagoons. Lagoons would be designed to contain and evaporate all effluent. All facilities would be constructed to meet all Federal, State, and local standards.

13. Comment:

Attachment 1 should be carefully edited to insure that the correct values and appropriate reporting units have been recorded.

Response:

Attachment I has been reviewed and appropriate corrections have been made.



DEPARTMENT OF THE ARMY
SACRAMENTO DISTRICT, CORPS OF ENGINEERS
650 CAPITOL MALL
SACRAMENTO, CALIFORNIA 95814

REPLY TO
ATTENTION OF

SPKED-W

13 December 1976

Mr. G. G. Stamm, Commissioner
U.S. Department of Interior
Bureau of Reclamation
Washington, D.C. 20240

Dear Mr. Stamm:

The Acting Commissioner's letter dated 4 November 1976 to the Assistant Director of Civil Works, Office of the Chief of Engineers, inclosing for review and comment the draft environmental statement (INT DES 76-44) for the Dolores Project, Colorado, has been referred to the Sacramento District for reply.

The flood control features of the Dolores Project were coordinated with the Los Angeles District prior to 1969 and afterwards with this district. We believe that the proposed project will not conflict with existing or contemplated flood control programs within our jurisdiction. Also, the navigability on the Colorado River downstream from the Dolores Project would not be significantly effected. However, a Department of the Army permit will be required by Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-500) for disposal of dredge or fill material in the Dolores River and adjacent wetland areas. The final environmental statement should specifically address water quality and related impacts resulting from each construction activity which falls within Section 404 jurisdiction. Also, the description of all proposed activities should be expanded to include discussion of provision for erosion and turbidity control and protection of water quality.

Thank you for the opportunity to review the draft environmental statement.

Sincerely yours,

DONALD M. O'SHEI
Colonel, CE
District Engineer

January 21, 1977

Memorandum

To: Files

Subject: Response to U.S. Army Corps of Engineers letter of December 13, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

However, a Department of the Army permit will be required by Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (Public Law 92-300) for disposal of dredge or fill material in the Dolores River and adjacent wetland areas. The final environmental statement should specifically address water quality and related impacts resulting from each construction activity which falls within Section 404 jurisdiction.

Response:

Under Section 404 of the Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500), Reclamation must acquire a 404 Permit from the Corps of Engineers for the disposal of dredge and fill material. In seeking this permit Reclamation must explain what measures it would employ in preventing the pollution of surface waters. These measures are included in the contract specifications to the contractor(s) and must be abided by. The general nature of these requirements is explained in nontechnical terms in Section D-2b.

2. Comment:

The description of all proposed activities should be expanded to include discussion of provision for erosion and turbidity control and protection of water quality.

Response:

The construction contractor would be restricted from allowing waste waters or eroded materials to enter a watercourse without turbidity control methods such as settling ponds or flocculating processes. In accordance with the Federal Water Pollution Control Act (P.L. 92-500),

- (1) prior to discharging any waste water or other pollutants, the Bureau of Reclamation would obtain a permit from EPA as required under the National Pollutant Discharge Elimination System (NPDES),
- (2) where there is a potential for spillage of a specified volume of oil into a watercourse, a Spill Prevention Control and Counter Measure Plan will be prepared, and

- (3) before discharging any dredged or fill materials, the Bureau of Reclamation would obtain a permit from the Corps of Engineers as provided in Section 404 of the Act.



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

OFFICE OF THE SECRETARY

WASHINGTON, D.C. 20201

DEC 10 1976

Mr. D. D. Anderson
Acting Commissioner
Bureau of Reclamation
U.S. Department of the Interior
Washington, D.C. 20240

Dear Mr. Anderson:

This Department has reviewed the draft environmental impact statement concerning the Dolores Project, Colorado.

The DEIS should contain a more systematic treatment of the project impacts on the high-risk Piute Indian population. Although the statement notes that financial resources of the Indians are at a low level, it does not provide information as to how their condition will be bettered as a result of this project beyond a projected increased income from agricultural ventures. It is noted that water could be provided to farm units not exceeding 220 and 234 acres; however, no information is provided to indicate if such acreage constitutes a viable farm operation capable of providing a sufficient income to support a farm family. Information should be provided to indicate the level of individual or Tribal Council investment necessary in order to enable subject families to take advantage of the improved supply of water for agricultural purposes.

Thank you for the opportunity to review the document.

Sincerely,

Charles Custard
Director

Office of Environmental Affairs

March 7, 1977

Memorandum

To: Files

Subject: Response to Office of Secretary, U.S. Department of Health, Education, and Welfare Letter of December 20, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

The DEIS should contain a more systematic treatment of the project impacts on the high-risk Piute Indian population. Although the statement notes that financial resources of the Indians are at a low level, it does not provide information as to how their condition will be bettered as a result of this project beyond a projected increased income from agricultural ventures.

Response:

Without the project it would become increasingly difficult for the Indians to remain on the reservation and maintain their cultural values. Traditionally, the tribe has striven to retain much of its culture and is making a concerted effort to continue to do so. Staying on the reservation has been an important factor in the retention of these values. Presently, the tribal members depend heavily on the tribal fund as an annual source of income because of limited employment opportunities on the reservation. The fund, which receives revenues from tribal industries and energy resource leases, has undergone a gradual decline and thus needs a stabilizing source of income which could be provided with the development of 7,500 acres of agricultural lands under project conditions. Without the project most tribal members would find it difficult to remain with their cultural group and might be forced to leave the reservation in search of employment.

2. Comment:

It is noted that water could be provided to farm units not exceeding 220 and 234 acres; however, no information is provided to indicate if such acreage constitutes a viable farm operation capable of providing a sufficient income to support a farm family. Information should be provided to indicate the level of individual or Tribal Council investment necessary in order to enable subject families to take advantage of the improved supply of water for agricultural purposes.

Response:

The sizes of farms to which project water could be provided were determined with the aid of data collected during a farm management survey of irrigated farms in the area. The sizes have been revised to 230 acres of class 2 land and 250 acres of class 3 land. In the economic analysis it was determined that this size of farm would provide returns sufficient

to pay all farm expenses, including interest on the farmer's investment, provide the farmer a sufficient family income, and enable him to pay irrigation operating and maintenance costs as well as a portion of the project construction costs. In accordance with Department of the Interior policy the detailed economic analyses are not included in this environmental statement but the data are available for review in Bureau of Reclamation offices in Salt Lake City, Utah, and Durango, Colo.



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

PUBLIC HEALTH SERVICE

CENTER FOR DISEASE CONTROL

ATLANTA, GEORGIA 30333

January 6, 1977

Mr. Alan D. Benefiel
Senior Staff Officer
Western Colorado Projects Office
Durango Planning Field Division
Bureau of Reclamation
P. O. Box 640
Durango, Colorado 81301

Re: 730/120

Dear Mr. Benefiel:

We have reviewed the draft environmental statement on the Dolores Project, Colorado for the inclusion of information pertaining to vectorborne disease impacts and our comments are herewith submitted.

As you may recall, our office was consulted in the project's early assessment stages for pertinent information on the status of vector problems in the area and several communications have been exchanged between our office and the Durango division of the Bureau of Reclamation. The letter, dated November 2, 1976, accompanying the draft EIS, requested comments within 45 days. Water Resources Branch was transferred to Atlanta from Fort Collins, Colorado last August, but the project files and correspondence were not moved until December. Your letter and the EIS were inadvertently packed and were discovered today. We hope that our remarks can be included in the final EIS or its supplement.

Because communications between our offices had been open and direct, vectorborne disease impacts which could be caused by the project were adequately discussed, and control of potential problems given necessary consideration. However, information shown on page C-25 is inaccurate in regard to vector problems associated with irrigated agriculture. Rather than having a minimal effect on the creation of mosquito-producing habitats, the opposite is true. Numerous examples are found in Colorado as well as the western United States where the extension of irrigation has introduced or intensified mosquito problems. Seepage collections emanating from high line canals in the Grand Junction area are prolific producers of mosquitoes, and seepage occurs on all distribution canals. Sprinkler irrigation has been shown to create mosquito habitats where the land was improperly prepared and where the application rate was poorly managed. Poor drainage of irrigation runoff has caused intense mosquito problems near Alamosa and in the Florida project, necessitating the formation of mosquito control districts in both areas.

Mr. Alan D. Benefiel - Page 2

Lastly, the Irrigation Management Scheduling (IMS) program, while sounding good because of its water management overtone, has been shown by Water Resource Branch studies in 1975 in Mesa County, to be ineffective as a mosquito control measure. We believe the statement pertaining to the foregoing should be deleted from the final EIS, and we would be happy to discuss it further with you.

We are pleased to participate in the review process, as we have been during the entire project development. If we can be of any further assistance, please let us know.

Sincerely yours,



Samuel G. Breeland, Ph.D.
Water Resources Activities
Vector Biology & Control Division
Bureau of Tropical Diseases

CC:

Mr. Ted Davis

HEW Region VIII

January 21, 1977

Memorandum

To: Files

Subject: Response to U.S. Department of Health, Education, and Welfare,
Public Health Service Letter of January 6, 1977, on Dolores
Project Draft Environmental Statement

1. Comment:

Because communications between our offices had been open and direct, vector borne disease impacts which could be caused by the project were adequately discussed, and control of potential problems given necessary consideration. However, information shown on page C-25 is inaccurate in regard to vector problems associated with irrigated agriculture. Rather than having a minimal effect on the creation of mosquito-producing habitats, the opposite is true. Numerous examples are found in Colorado as well as the Western United States where the extension of irrigation has introduced or intensified mosquito problems. Seepage collections emanating from high line canals in the Grand Junction area are prolific producers of mosquitoes, and seepage occurs on all distribution canals. Sprinkler irrigation has been shown to create mosquito habitats where the land was improperly prepared and where the application rate was poorly managed. Poor drainage of irrigation runoff has caused intense mosquito problems near Alamosa and in the Florida project, necessitating the formation of mosquito control districts in both areas. Lastly, the Irrigation Management Scheduling (IMS) program, while sounding good because of its water management overtone, has been shown by Water Resource Branch studies in 1975 in Mesa County, to be ineffective as a mosquito control measure. We believe the statement pertaining to the foregoing should be deleted from the final EIS, and we would be happy to discuss it further with you.

Response:

The intent of the discussion in Section C-9 is to indicate not that project irrigation would have no effect in creating mosquito habitat, but that measures proposed for efficient water use also reduce the possibility of mosquito production in such habitat as much as is practical. The seepage problems from canals and distribution laterals in the Grand Junction area occur primarily because the facilities are unlined. In contrast, the Dolores Project canals and laterals would be constructed of thick earth lining, concrete lining, and buried pipe, all of which would considerably reduce seepage rates. The sprinkler irrigation proposed for the full service land would be much more efficient than gravity systems on existing projects (70 percent, as opposed to 45 or 50 percent) and, in combination with the proper land preparation, water application rates, and drainage facilities, would limit the

potential mosquito problems. The IMS program would probably be more effective in controlling mosquito production on the Dolores Project than it has been in Mesa County, since in the latter area it has been applied to unlined, gravity irrigation systems.

The cumulative effect of these measures should minimize mosquito problems, as was indicated in the Public Health Service memorandum of April 14, 1975, on the Dolores Project:

"Much of the on-field mosquito production is associated with flooding-type irrigation on furrowed fields and pastures. We note that sprinkler irrigation will be utilized. If the land is properly graded and the water is used efficiently, it will minimize the opportunity for onfield mosquito production."



DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT

REGIONAL OFFICE

EXECUTIVE TOWER - 1405 CURTIS STREET

DENVER, COLORADO 80202

January 4, 1977

REGION VIII

IN REPLY REFER TO:

8DE

Acting Commissioner
U.S. Department of the Interior
Bureau of Reclamation
Washington, D.C. 20240

Dear Sir:

This is in response to your request to review and comment on the Draft Environmental Impact Statement (EIS) on the Dolores Project, Colorado.

The Department of Housing and Urban Development's (HUD) principal concerns are the effect of a proposed action on the urban environment and the consistency of an action with the comprehensive planning process. Since the Colorado State Clearinghouse has referred the Draft EIS to the San Juan Basin Regional Planning Commission for comment, requirements for comprehensive planning coordination have been fulfilled.

Historic preservation requirements have been met by coordination with the State Historic Preservation Officer. However, we suggest that you do not issue the Final EIS until the 460 known archaeological sites described as being disturbed, plus any additional sites identified, have been further evaluated by the State Historic Preservation Officer and the Advisory Council on Historic Preservation, especially in view of the richness in Indian ruins and sites of the Anasazi in this area.

The population expansion projected to the year 2030 at an annual increase of 1.5 percent (to 20,700 people) does not appear to be addressed by future planning considerations for housing and social services, which seem to be near capacity at this time. The use of mobile homes is the stated solution for construction workers, although the Draft statement recognizes that related facilities like roads, water and sewer, gas and electricity would have to be expanded. How would these services be implemented and financed? The same question may be asked concerning social, health, education and municipal services.

Insuring Offices

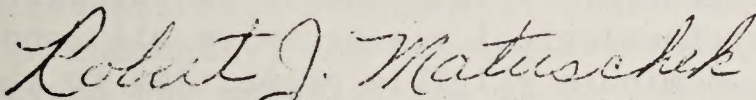
Casper, Wyoming • Denver, Colorado • Fargo, North Dakota • Helena, Montana • Salt Lake City, Utah • Sioux Falls, South Dakota

Under Employment and Incomes, you estimated that a total of about 6,270 people in direct employment will be generated over a nine year construction period. The disparage in the wages of these workers and normal local salaries may adversely affect present resident low-income families and fixed-income senior citizens, especially in regard to lack of housing alternatives. Frequently, construction salaries exceed the norms for the community, and housing, rentals, and commodities become inflated beyond the means of the local residents. The Draft EIS discusses, on page B-46, the unusually high ratio of low-income population in this area receiving public assistance.

A severe impact of HUD concern, both socially and economically, is the projected relocation of 45 families (120 people) living in the McPhee Reservoir area. On page E-2 you stated that "all of the people would have to find new housing, and some would be forced to leave the area and find new sources of income and establish new life styles." The Draft EIS does not list alternatives for the relocatees with regard to replacement housing or financial reimbursement, which should be addressed in the Final EIS.

We appreciate the opportunity to comment on this Draft EIS.

Sincerely,



Robert J. Matuschek
Assistant Regional Administrator
Community Planning and Development

March 7, 1977

Memorandum

To: Files

Subject: Response to U.S. Department of Housing and Urban Development
Letter of January 4, 1977 on Dolores Project Draft
Environmental Statement

1. Comment:

Historic preservation requirements have been met by coordination with the State Historic Preservation Officer. However, we suggest that you do not issue the Final EIS until the 460 known archaeological sites described as being disturbed, plus any additional sites identified, have been further evaluated by the State Historic Preservation Officer and the Advisory Council on Historic Preservation, especially in view of the richness in Indian ruins and sites of the Anasazi in this area.

Response:

As discussed in Section D-3.b. the Bureau of Reclamation is in the process of undertaking a program to survey archaeological resources on all land to be acquired for project purposes, nominate eligible properties to the National Register of Historic Places, and develop and carry out specific mitigation programs in coordination with the State Historic Preservation Officer and the Advisory Council on Historic Preservation. Although the Final Environmental Statement is being issued, no construction would occur until necessary coordination had been accomplished with the State Historic Preservation Officer and the Advisory Council on Historic Preservation in accordance with the provisions of 36 CFR 800.

2. Comment:

The population expansion projected to the year 2030 at an annual increase of 1.5 percent (to 20,700 people) does not appear to be addressed by future planning considerations for housing and social services, which seem to be near capacity at this time. The use of mobile homes is the stated solution for construction workers, although the Draft statement recognizes that related facilities like roads, water and sewer, gas and electricity would have to be expanded. How would these services be implemented and financed? The same question may be asked concerning social, health, education and municipal services.

Response:

As discussed in section C-13.a., the projected annual growth rate in the project area is 1.5 percent without the project and 1.6 percent with the project. It has been calculated, as shown in Table C-6, that by the

year 2030 the project area with construction would have experienced a total population increase of about 23,285 persons. This increase is only about 2,600 persons more than forecast for the area without the project. Reclamation recognizes that municipal and public services would undergo some stress during the peak construction years. Except in fields such as education where Federal and State aid is authorized and available, counties and municipalities would expand facilities through increased property taxes and bond issues. In the private sector expansion would be accomplished through the investment of private capital and personal initiative. Over the long haul, the project would be beneficial to the area since it would increase the taxable value of farmland, stimulate local business, and provide a reliable and adequate municipal water supply.

3. Comment:

Under Employment and Incomes, you estimated that a total of about 6,270 people in direct employment will be generated over a nine year construction period. The disparity in the wages of these workers and normal local salaries may adversely affect present resident low-income families and fixed-income senior citizens, especially in regard to lack of housing alternatives. Frequently, construction salaries exceed the norms for the community, and housing, rentals, and commodities become inflated beyond the means of the local residents. The Draft EIS discusses, on page B-46, the unusually high ratio of low-income population in this area receiving public assistance.

Response:

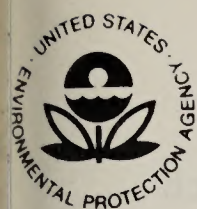
The statement has been corrected to read: "During the 9-year construction period the project would provide a total of about 6,270 man-years in direct employment. . ." This does not mean that 6,270 people would be directly employed over the 9-year construction period since in many instances one person would hold the same job for several years. The Bureau of Reclamation agrees that the wages of project workers during the peak years of construction could adversely impact the purchasing power of low-income and fixed-income families, particularly in the area of rental housing and has so stated in sections C-13.b. and E-5.

4. Comment:

A severe impact of HUD concern, both socially and economically, is the projected relocation of 45 families (120 people) living in the McPhee Reservoir area. On page E-2 you stated that "all of the people would have to find new housing, and some would be forced to leave the area and find new sources of income and establish new life styles." The Draft EIS does not list alternatives for the relocatees with regard to the replacement housing or financial reimbursement, which should be addressed in the Final EIS.

Response:

As explained in Chapter A-6.a.(2), investigations needed to formulate a relocation plan are in progress and preliminary indications are that the vast majority of the displaced individuals desire to remain in the area. However, there is a very limited amount of housing available and the majority of the available housing does not meet the criteria (decent, safe, and sanitary) of Public Law 91-646. Accordingly, it appears that construction of "Last Resort" housing would be required in order to provide relocation opportunities. In instances where the displaced persons elect to relocate existing dwellings or build new ones, either on remaining properties or acquired acreage, assistance and compensation would be provided to them in accordance with provisions of said law. In cases where the displaced person elected to leave the area, he would also be accorded all the assistance and compensation legally available under said law.



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VIII
1860 LINCOLN STREET
DENVER, COLORADO 80203

DEC 14 1976

Ref: 8W-EE
D-IBR-J34007-CO

Mr. David L. Crandall
Regional Director
Upper Colorado Regional Office
Bureau of Reclamation
Federal Building
125 South State Street
Salt Lake City, Utah 84147

The Environmental Protection Agency has reviewed the draft environmental impact statement (EIS) on the Dolores Project, Colorado. The rating assigned to this draft is Environmental Reservations, Insufficient Information. This means that EPA has reservations about certain environmental impacts because we believe insufficient information was provided to assess fully the environmental impact of the proposed project. The following comments outline those subjects of the EIS for which we request the Bureau of Reclamation provide additional information.

The Dolores Project is one of twenty-four projects which are part of the Colorado River Storage Act. While it is appropriate and necessary to analyze each of these projects individually, it is also necessary to consider the cumulative effects of these projects where the cumulative effects can be identified, which could be accomplished by a programmatic EIS. We think the Bureau should establish a standard tabular accounting procedure for reporting cumulative salinity impacts that could be updated and included in each project EIS. This table could show the cumulative salinity increases from existing projects plus the proposed project, as well as salinity decreases from implementation of the Colorado River Water Quality Improvement Program. Such a tabular account might be coordinated with the efforts of the Colorado River Salinity Forum.

With regard to this particular project, it is unclear whether the salinity calculations have taken into account the nature of the soils the water would be in contact with prior to irrigation. Several of the dams and canals, particularly Dove Creek Canal, pass through the brackish Mancos Shales. Would passage through such areas significantly effect the water quality, and is this type of loading accounted for in the salinity irrigation return flow calculations? Since Grand Valley

has experienced similar problems in their canals and laterals, which are now requiring corrective measures, we feel the Bureau should evaluate this possibility in the Dolores Project. Another factor concerning salt loadings which is unclear in the statement deals with ground water loadings as a result of subsurface dam seepage through Mancos beds. We would like the Bureau to address whether such seepage could increase the salt loadings to the river through ground water, above what they have calculated for irrigation return flows and flow depletion.

It is apparent from both the environmental assessment which was circulated on this project and from the draft EIS that irrigation scheduling and sprinkler systems will reduce the salt loading effects of this project. EPA had commented that the environmental assessment made no mention of whether the existing farmers would be able to afford such an irrigation system and asked the Bureau to discuss the capability of the local farmers to participate fully in this project. Since this subject was not discussed in the draft EIS, we again request that the Bureau include a discussion on the economic capability of the local farmers to participate in this project.

The Bureau of Reclamation has described the nature of the heavy metal toxicity problems at the dam site. It does not appear likely that a significant problem with toxic substances would occur as a result of this project. There are, however, certain factors which could influence the solubility of the heavy metals, although, in this case, it appears unlikely that such factors would significantly alter the water quality of the reservoir. These factors include:

- a. Organic decomposition in the benthic layer of the reservoir could cause acidic conditions which would facilitate the dissolution of heavy metals.
- b. If significant amounts of heavy metal sulfates were on the bottom, sulfate bacteria could react with these salts and release the heavy metals back into solution.
- c. Turnover of the reservoir twice yearly could resuspend bottom sediments and mix any dissolved heavy metals resulting from the above two processes back into the water column.

We would like the Bureau to address the possibility that the above occurrences could exist in McPhee Reservoir.

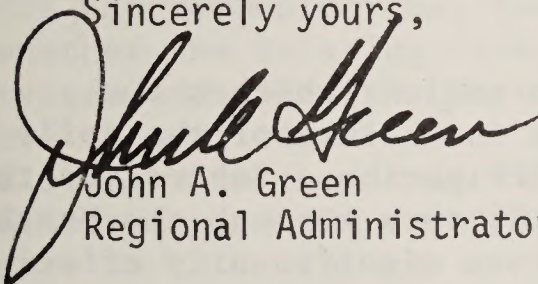
Although not in the project area, there are several points in the discussion on the water quality at Bedrock which should be clarified. It is indicated that heavy metals and toxic substances are present

at Bedrock, but Attachment 1 does not include any data on heavy metals for the Bedrock area. The source of this information should be identified. Also, it is unclear whether the concentrations of heavy metals exceed drinking water standards. Erosion is the stated source of the heavy metals at Bedrock; however, there is no discussion of what is being eroded between the project area and Bedrock which would contribute heavy metals.

The impact statement does identify the impacts on the local communities as a result of the project. One of those impacts will be the relocation of the Dolores sewage treatment plant. It is stated that the project funds would buy the plant at replacement value and that Dolores would have better sewage treatment facilities as a result of the project. Would replacement value of the existing facilities provide the city with enough funds to actually upgrade their treatment facilities? Would the funds cover the cost of replacing the interceptor pipes, relocating the interceptors into the new facility, and any other additional pumps which might be required? Would the city have any monies for this relocation of the sewage treatment facilities? We would also like to know if the communities affected by this project are developing any plans to cope with the short-term stresses, such as increasing municipal services and tax burdens, caused by the short-term population fluxes that will be placed on them as a result of this project.

Thank you for the opportunity to review this EIS. Please send five (5) copies of the final EIS to us. If you have any questions about these comments, please do not hesitate to contact this office.

Sincerely yours,



John A. Green
Regional Administrator

March 7, 1977

Memorandum

To: Files

Subject: Response to Environmental Protection Agency letter of
December 14, 1976, on Dolores Project Draft Environmental
Statement

1. Comment:

The Dolores Project is one of twenty-four projects which are part of the Colorado River Storage Act. While it is appropriate and necessary to analyze each of these projects individually, it is also necessary to consider the cumulative effects of these projects where the cumulative effects can be identified, which could be accomplished by a programmatic EIS. We think the Bureau should establish a standard tabular accounting procedure for reporting cumulative salinity impacts that could be updated and included in each project EIS. This table could show the cumulative salinity increases from existing projects plus the proposed project, as well as salinity decreases from implementation of the Colorado River Water Quality Improvement Program. Such a tabular account might be coordinated with the efforts of the Colorado River Salinity Forum.

Response:

See Section C14.

2. Comment:

With regard to this particular project, it is unclear whether the salinity calculations have taken into account the nature of the soils the water would be in contact with prior to irrigation. Several of the dams and canals, particularly Dove Creek Canal, pass through the brackish Mancos Shales. Would passage through such areas significantly effect the water quality, and is this type of loading accounted for in the salinity irrigation return flow calculations? Since Grand Valley has experienced similar problems in their canals and laterals, which are now requiring corrective measures, we feel the Bureau should evaluate this possibility in the Dolores Project. Another factor concerning salt loadings which is unclear in the statement deals with ground water loadings as a result of subsurface dam seepage through Mancos beds. We would like the Bureau to address whether such seepage could increase the salt loadings to the river through ground water, above what they have calculated for irrigation return flows and flow depletion.

Response:

All project constructed canals would have thick earthlining which would minimize seepage. Tests show little difference in seepage from earth-lined canals and concrete-lined canals, consequently canals passing through the Mancos Shale areas would not pick up any significant amount of salts. Canal seepage problems in Grand Valley are from unlined canals.

Salt loading by subsurface dam seepage would not be a problem at McPhee Dam and Monument Creek Dam. Mancos Shale occurs and is exposed near the Great Cut Dike. The MVI Company has an unlined canal passing through the area which has an observable seepage problem. Subsurface seepage and stored water in contact with the area would pick up salts at this location but the incremental difference compared to the present situation should be very minor.

Although there may be some residual soil derived from Mancos Shale at Dawson Draw, there are no outcrops of that formation at the site or in exploratory drill holes. The area has been irrigated for many years by water from MVIC. Some salts are still leached from the area but at a rate much smaller than when the lands were initially irrigated. Construction of Dawson Draw Reservoir would not produce any significant amount of new salt pickup. It is estimated that there would be a decrease in salt pickup as compared to present conditions for the reasons explained in Section C-5.

3. Comment:

It is apparent from both the environmental assessment which was circulated on this project and from the draft EIS that irrigation scheduling and sprinkler systems will reduce the salt loading effects of this project. EPA had commented that the environmental assessment made no mention of whether the existing farmers would be able to afford such an irrigation system and asked the Bureau to discuss the capability of the local farmers to participate fully in this project. Since this subject was not discussed in the draft EIS, we again request that the Bureau include a discussion on the economic capability of the local farmers to participate in this project.

Response:

Detailed farm budget studies made by the Bureau of Reclamation demonstrate that the farmers would have capability to pay project operation, maintenance, and replacement costs and to make payments toward project construction costs. In line with Department of the Interior policy, results of economic studies are not included in the environmental statement but are available in Bureau of Reclamation offices in Salt Lake City, Utah, and Durango, Colo.

4. Comment:

The Bureau of Reclamation has described the nature of the heavy metal toxicity problems at the dam site. It does not appear likely that a significant problem with toxic substances would occur as a result of this project. There are, however, certain factors which could influence the solubility of the heavy metals, although in this case, it appears unlikely that such factors would significantly alter the water quality of the reservoir. These factors include:

- a. Organic decomposition in the benthic layer of the reservoir could cause acidic conditions which would facilitate the dissolution of heavy metals.
- b. If significant amounts of heavy metal sulfates were on the bottom, sulfate bacteria could react with these salts and release the heavy metals back into solution.
- c. Turnover of the reservoir twice yearly could resuspend bottom sediments and mix any dissolved heavy metals resulting from the above two processes back into the water column.

We would like the Bureau to address the possibility that the above occurrences could exist in McPhee Reservoir.

Response:

Conditions of (a) and (b) could exist on a limited basis or under certain chemical situations. With the existing water chemistry, however, these conditions would not be expected to evolve to problem levels. As stated in Section C-5, heavy metals would occur in a precipitated and biologically unavailable form. For heavy metal ions to enter solution (c), a violent turnover and a drop in pH would be required. Considering the physical nature of the reservoir basin and the operation of the multiple level outlet works, such an occurrence would be remote.

5. Comment:

Although not in the project area, there are several points in the discussion on the water quality at Bedrock which should be clarified. It is indicated that heavy metals and toxic substances are present at Bedrock, but Attachment 1 does not include any data on heavy metals for the Bedrock area. The source of this information should be identified. Also, it is unclear whether the concentrations of heavy metals exceed drinking water standards. Erosion is the stated source of the heavy metals at Bedrock; however, there is no discussion of what is being eroded between the project area and Bedrock which would contribute heavy metals.

Response:

Since Bedrock is not in the project area, only a peripheral discussion was made to characterize downstream, nonproject water. Since heavy

metal concentrations are not expected to increase with the project, no extensive examination is considered necessary.

6. Comment:

The impact statement does not identify the impacts on the local communities as a result of the project. One of these impacts will be the relocation of the Dolores sewage treatment plant. It is stated that the project funds would buy the plant at replacement value and that Dolores would have better sewage treatment facilities as a result of the project. Would replacement value of the existing facilities provide the city with enough funds to actually upgrade their treatment facilities? Would the funds cover the cost of replacing the interceptor pipes, relocating the interceptors into the new facility, and any other additional pumps which might be required? Would the city have any monies for this relocation of the sewage treatment facilities? We would also like to know if the communities affected by this project are developing any plans to cope with the short-term stresses, such as increasing municipal services and tax burdens, caused by the short-term population fluxes that will be placed on them as a result of this project.

Response:

In the statement, the impacts upon local communities have been revised and expanded, largely as a result of comments received on the draft statement. As explained in Section A-6a(2) project funds would be provided to the town of Dolores for the design, relocation, and construction of a new treatment facility. A new trunk line from the present collection system to the plant would also be constructed as necessary with project funds. The Draft Environmental Statement was circulated to all affected community governments for their information and comment. Reclamation is cooperating to the full extent of its authority with these communities to help ensure that construction period impacts upon these communities are fully understood and anticipated.

FEDERAL ENERGY ADMINISTRATION

REGION VIII

1075 South Yukon

P.O. Box 26247, Belmar Branch

Lakewood, Colorado 80226

December 2, 1976

Mr. David L. Crandall
Regional Director
Upper Colorado Regional Office
Bureau of Reclamation
P. O. Box 11568
Salt Lake City, Utah 84147

Dear Mr. Crandall:

The Federal Energy Administration (FEA) Region VIII has reviewed the draft environmental statement (DES) on the Dolores Project-Colorado received by this office on November 15, 1976.

We submit the following comments regarding this DES:

- 1) The DES claims the salt loading of the Colorado River will be increased 9.4 mg/L as measured at the Imperial Dam, because of water depletion and salt contribution. The DES states that for each mg/L increase, \$230,000 damages per year are suffered downstream as a result (page 1-10 of the DES). Already the Colorado River salinity problem is causing treaty problems with Mexico. Salt removal facilities will be extremely energy intensive (estimated at 424 million KWh per year)¹ and costly (estimated at \$10-\$12 million annually at 1975 prices)², even with present day technologies. How will this project affect the downstream salinity removal process? Can the Colorado River salt removal facilities handle this increased amount? Is the above \$230,000 figure per year per mg/L damage included in the operating of the desalting plant? Please expand upon the salinity problems as correlated with the Colorado River Basin Salinity Control Project.
- 2) The McPhee Reservoir, as mentioned on page B-4, will be built with Entrada Sandstone on its flanks and a base consisting of Carmel FM. Since the Navajo Sandstone is normally located beneath the Carmel FM, and since the Navajo Sandstone has caused major infiltration and seepage problems around the flanks of the Glen Canyon Dam, we question whether the soft Carmel FM with underlying Navajo Sandstone may pose a similar problem, especially around the dam base? The above

¹ & ² Final Environmental Impact Statement on Colorado River Basin Salinity Control Project - Title I dated June 18, 1975.



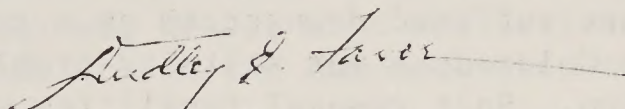
Save Energy and You Serve America!

problem (if it is a problem) may have already been considered, if so, what was decided? Has coring and testing of the sandstones around the dam uncovered any reason for concern?

The FEA feels the DES adequately addresses most issues. One area we thought was particularly noteworthy was the discussion of archaeological concerns. We concur with the Bureau of Reclamation that archaeological concerns in this particular area are quite important and should be handled accordingly.

Thank you for the opportunity to review this DES.

Sincerely,


Dudley E. Faver
Regional Administrator

January 21, 1977

Memorandum

To: Files

Subject: Response to letter of Federal Energy Administration, Region VIII,
December 2, 1976, on the Dolores Project Draft Environmental
Statement

1. Comment:

The DES claims the salt loading of the Colorado River will be increased 9.4 mg/L as measured at the Imperial Dam, because of water depletion and salt contribution. The DES states that for each mg/L increase, \$230,000 damages per year are suffered downstream as a result (page 1-10 of the DES). Already the Colorado River salinity problem is causing treaty problems with Mexico. Salt removal facilities will be extremely energy intensive (estimated at 424 million KWh per year)^{1/} and costly (estimated at \$10-\$12 million annually at 1975 prices)^{2/}, even with present day technologies. How will this project affect the downstream salinity removal process? Can the Colorado River salt removal facilities handle this increased amount? Is the above \$230,000 figure per year per mg/L damage included in the operating of the desalting plant? Please expand upon the salinity problems as correlated with the Colorado River Basin Salinity Control Project.

Response:

The Dolores Project would not directly affect the operation of the desalting plant since the proposed plant will only desalt drainage and return flow from the Wellton-Mohawk Unit of the Gila Project offstream from the Colorado River on the Gila River. Although the continued development of the water apportioned to the Upper Basin States by the Colorado River Compact of 1922 and the Upper Colorado River Basin Compact of 1948 was considered in the plant's design capacity, plant operation will not decrease the salinity levels of the water used within the boundaries of the United States. The plant's sole function is to help insure that the water reaching Mexico has an average annual salt concentration no more than 115 mg/l, \pm 30 mg/l, over the annual average salinity at Imperial Dam as agreed upon by the United States in Minute 242, International Boundary and Water Commission. The plant's operational pattern will not be static but will depend in large measure upon the volume of flow in the Colorado River below Imperial Dam and to a much lesser extent upon the amount of the salinity contributed to the river by upstream water development projects.

1/ & 2/ Final Environmental Impact Statement on Colorado River Basin Salinity Control Project - Title I dated June 18, 1975.

The \$230,000 annual mg/l figure is a measure of damages caused by salinity within the United States at Imperial Dam and is used in determining the economic desirability of any project being considered for construction. For an expanded statement about the Colorado River Basin Salinity Control Project see the Cumulative Impact Section, Page C-14.

2. Comment:

The McPhee Reservoir, as mentioned on page B-4, will be built with Entrada Sandstone on its flanks and a base consisting of Carmel Fm. Since the Navajo Sandstone is normally located beneath the Carmel Fm, and since the Navajo Sandstone has caused major infiltration and seepage problems around the flanks of the Glen Canyon Dam, we question whether the soft Carmel Fm with underlying Navajo Sandstone may pose a similar problem, especially around the dam base? The above problem (if it is a problem) may have already been considered, if so, what was decided? Has coring and testing of the sandstones around the dam uncovered any reason for concern?

Response:

At McPhee Dam site, Entrada Sandstone is about 250 feet in thickness and is a tan to whitish, moderately hard, medium-grained sandstone composed of rounded, partially cemented quartz grains. The formation exhibits a fair degree of porosity due to its degree of cementation but has a low permeability rate as a material. It has very large cross-beds throughout the typically high, barren, rounded cliff outcrops. Drill hole water tests indicate generally low ranges of percolation. Entrada Sandstone, which in this case forms the dam abutments totally, is a structurally firm rock for engineering purposes.

The Carmel Formation which conformably underlies the Entrada is about 100 feet in thickness and is reddish to mottled red-whitish, shaly to limy siltstone and fine-grained sandstone. It has a fairly uniform, somewhat massive structure, is moderately hard with some softer spots throughout, and has low porosity and permeability. Water tests indicated little to no percolation. It is a generally weak formation in steep slopes, but where it is armored, undisturbed, and/or lying horizontally as along McPhee Reservoir, it is a firm, water-tight material. It is the foundation for the dam.

Navajo Sandstone, conformably underlying the Carmel, is about 200 feet or less in thickness. It is a tan to yellowish, coarse-grained, fairly well cemented sandstone composed of subrounded quartz grains, is moderately hard, and is massive to slightly cross-bedded in texture. It is not exposed at the dam but would be considered during grouting and could therefore be included in the lower portion of the grout curtain. Cores from some upper zones soaked water up readily, indicating varied but limited porosity, but all water tests indicated little to no percolation and therefore similar permeability can be expected. Although not established by drilling and water testing, one general zone at or near the top of the formation is considered the only probability for percolation.

All three of the above Jurassic Age formations along McPhee Reservoir are near the outer limit of their more extensive expression in Glen Canyon, Utah. Proceeding upstream along the Dolores River, Entrada is a ledge of diminishing thickness, and nearing Rico, Colorado, it and the underlying Carmel and Navajo Formations are missing or altered and categorically included in the Rico Formation. Therefore at the McPhee site, the formations have lithologic characteristics and formation thicknesses that are partially to distinctly dissimilar from their correlated counterparts in distant Glen Canyon.

b. Comments from State and Local Governments

State of California, Colorado River Board of California

State of Colorado

*Department of Local Affairs, Division of Planning
Department of Natural Resources

State of New Mexico

*Office of the Governor
*State Engineers Office
State Planning Office

Montezuma and Dolores County Planning Commissions

*These letters express general agreement with the project plan. No issue is raised for which a response is considered necessary. The review of the Draft Environmental Statement, however, is appreciated.

RAYMOND R. RUMMONDS
CHAIRMAN AND COLORADO
RIVER COMMISSIONER
COACHELLA VALLEY COUNTY
WATER DISTRICT

RAYMOND E. BADGER
SAN DIEGO COUNTY
WATER AUTHORITY
WARREN W. BUTLER

THE METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

HAROLD F. PELLEGRIN
EXECUTIVE SECRETARY



STATE OF CALIFORNIA
Colorado River Board of California

107 SOUTH BROADWAY, ROOM 8103
LOS ANGELES, CALIFORNIA 90012
(213) 620-4480

VIRGIL L. JONES
PALO VERDE IRRIGATION DISTRICT

DEPARTMENT OF WATER AND
POWER, CITY OF LOS ANGELES
ROBERT F. CARTER

IMPERIAL IRRIGATION DISTRICT

MYRON S. HOLBURT
CHIEF ENGINEER

December 10, 1976

Mr. David L. Crandall
Regional Director
Upper Colorado Region
U. S. Bureau of Reclamation
Post Office Box 11568
Salt Lake City, Utah 84111

Dear Mr. Crandall:

We have reviewed the Draft Environmental Statement (DES) for the Dolores Project, Colorado (INT DES 76-44) dated November 1, 1976, and have no objections to the project. The DES covers several of the items that we recommended to be covered in our comments on environmental statements on other projects, and we commend you for covering these items. There are still some items, however, that should be covered in greater detail in this DES.

Potential Salt Pick-up by Project Facilities

The DES shows that Mancos shale is present in portions of the main project reservoir, McPhee Reservoir, and in Dawson Reservoir, but there is no discussion as to whether or not there will be any salt pick-up resulting from these project facilities. Also, the Dove Creek area canals pass through Mancos shale and, as the report indicates that sections of the canals are earthlined, there are potential infiltration and salt pickup problems with these canals. It is recommended that the sections of the canals that pass through Mancos shale should all be concrete-lined, as is now being planned for the Grand Valley Salinity Control Unit.

Possible Salt Load Reduction on Project
Lands Draining to McElmo Creek

The salt load of McElmo Creek is so substantial that it was identified as a possible salinity control unit by the Congress in P.L. 93-320, and a planning report thereon was requested to be prepared. The Dolores Project will provide supplemental water to the Montezuma Valley area, which drains into McElmo Creek, and the DES referred to the "moderately high salt content" of the soils in the southern part of Montezuma Valley. However, the DES seems to disregard its own statement about the high soil-salt content as well as the significance of

Mr. D. L. Crandall
December 10, 1976
Page Two

McElmo Creek being a salinity control planning unit, and proposes no special measures for reducing the salt pickup on Montezuma Valley lands. It even states that, while an irrigation management program will be instituted for the new lands to be developed as part of the project, none would be instituted for the supplemental irrigation lands of the Montezuma Valley.

Since the Bureau of Reclamation is instituting irrigation management and scheduling on projects throughout the Colorado River Basin to reduce salt pickup, it is recommended that such a program be made part of the Dolores Project supplemental irrigation service area. The DES should be revised accordingly.

We appreciate the opportunity to comment on the Dolores Project DES.

Sincerely yours,

Vernon E. Valentine

for Myron B. Holburt
Chief Engineer

January 21, 1977

Memorandum

To: Files

Subject: Response to Colorado River Board of California, December 10, 1976, Letter on Dolores Draft Environmental Statement

1. Comment:

Potential Salt Pick-up by Project facilities

The DES shows that Mancos shale is present in portions of the main project reservoir, McPhee Reservoir, and in Dawson Reservoir, but there is no discussion as to whether or not there will be any salt pick-up resulting from these project facilities. Also, the Dove Creek area canals pass through Mancos shale and, as the report indicate that sections of the canals are earthlined, there are potential infiltration and salt pickup problems with these canals. It is recommended that the sections of the canals that pass through Mancos shale should all be concrete-lined, as is now being planned for the Grand Valley Salinity Control Unit.

Response:

The amount of salt that may be picked up from Mancos Shale by either McPhee or Dawson Draw Reservoir is expected to be very small since only a small amount of the formation is found at either site. At the site of McPhee Reservoir the shale is exposed near Great Cut Dike, where an existing MVIC canal with a seepage problem is located. The difference in salt pickup between the canal and the reservoir should be minor.

Dawson Draw may have some soil derived from Mancos Shale, but the formation has not been found in outcrops or exploratory drill holes. This area has been irrigated for many years, leaching much of the salt from the soil. The reservoir is expected to pick up very little additional salt.

The Dove Creek Canal would have a very thick earth lining. Tests have shown very little difference in seepage between this type of lining and concrete lining; therefore, no significant salt pickup can be attributed to the use of an earth lining.

2. Comment:

Possible Salt Load Reduction on Project Lands Draining to McElmo Creek

The salt load of McElmo Creek is so substantial that it was identified as a possible salinity control unit by the Congress in P.L. 93-320, and a planning report thereon was requested to be prepared. The Dolores

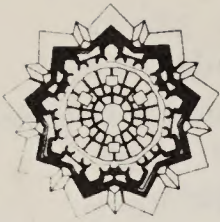
Project will provide supplemental water to the Montezuma Valley area, which drains into McElmo Creek, and the DES referred to the "moderately high salt content" of the soils in the southern part of Montezuma Valley. However, the DES seems to disregard its own statement about the high soil-salt content as well as the significance of McElmo Creek being a salinity control planning unit, and proposes no special measures for reducing the salt pickup on Montezuma Valley lands. It even states that, while an irrigation management program will be instituted for the new lands to be developed as part of the project, none would be instituted for the supplemental irrigation lands of the Montezuma Valley.

Since the Bureau of Reclamation is instituting irrigation management and scheduling of projects throughout the Colorado River Basin to reduce salt pickup, it is recommended that such a program be made part of the Dolores Project supplemental irrigation service area. The DES should be revised accordingly.

Response:

As explained in Section C-5.C.(1), no additional salts would be picked up by supplemental service irrigation in the Montezuma Valley area. The Montezuma Valley Irrigation Company has requested that irrigation management and scheduling not be provided on their lands as a part of the Dolores Project.

The opportunities to improve facilities and irrigation practices to reduce salt pickup from the Montezuma Valley area will be considered in the McElmo Creek Unit salinity studies.



Department of Local Affairs Colorado Division of Planning

Philip H. Schmuck, Director



Richard D. Lamm, Governor

November 9, 1976

Mr. David Crandall
Bureau of Reclamation
Upper Colorado Regional Office
P. O. Box 11568
Salt Lake City, Utah 84147

SUBJECT: Draft Environmental Impact Statement
Dolores Project

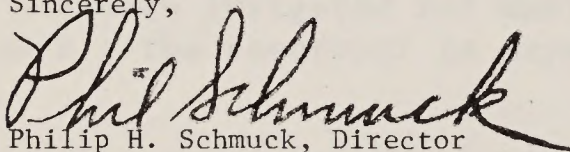
Dear Mr. Crandall:

Please be advised that the Colorado Department of Natural Resources has been designated as the "Lead Agency" for the above-referenced review effort. Mr. David Walker will serve as the central contact person coordinating the review.

A lead agency is intended as a coordinative aid for providing review by interested state agencies. The designation is not intended to bar direct contacts between other state agencies and the Bureau of Reclamation whenever you feel such contacts are appropriate. However, unified state policy positions will be transmitted only through Lead Agency and State Clearinghouse.

If we can provide any coordinative assistance, please feel free to contact us.

Sincerely,


Philip H. Schmuck, Director
Colorado Clearinghouse

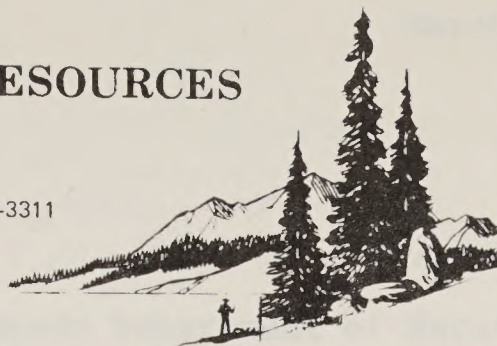
PHS/CGJ/vt

520 State Centennial Building, 1313 Sherman Street, Denver, Colorado 80203 (303) 892-2351

DEPARTMENT OF NATURAL RESOURCES

HARRIS D. SHERMAN, Executive Director
Gerald D. Sjaastad, Deputy Director
David W. Walker, Assistant Director

1313 Sherman St., Room 718, Denver, Colorado 80203 892-3311



Board of Land Commissioners
Division of Administration
Division of Mines
Division of Parks & Outdoor Recreation
Division of Water Resources
Division of Wildlife
Geological Survey
Oil and Gas Conservation Commission
Soil Conservation Board
Water Conservation Board
Mined Land Reclamation

January 10, 1977

David L. Crandall, Regional Director
Bureau of Reclamation
P. O. Box 11568
Salt Lake City, Utah 84111

Dear Dave:

The State of Colorado has reviewed the Draft Environmental Statement for the proposed Dolores Project through its Clearinghouse procedures. On the basis of reviews by state agencies, the report is a sufficient description and analysis of environmental impacts.

Since several agencies have suggestions for improvements and corrections to be incorporated in a final statement I am forwarding the appropriate review statements. Nevertheless, several topics are worthy of specific mention here. As expressed in the special review of the Savery-Pot Hook Project, Colorado's policy is to encourage water development which enhances agriculture. We are encouraged that the Dolores Project will result in even wider agricultural benefits. Again as with Savery-Pot Hook, we request that the repayment contracts contain stipulations that the water rights remain dedicated to agriculture unless any proposed use is approved by the Bureau of Reclamation and the State of Colorado.

Because of the number of water reclamation projects now underway or under consideration, the state is concerned about potential cumulative impacts. Therefore, we request a specific section on such impacts in the final statement, as will be prepared for the final Savery-Pot Hook EIS.

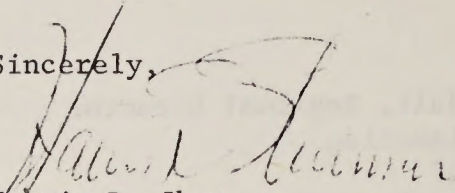
Analysis by the Division of Wildlife has determined that the proposed wildlife mitigation measures are adequate. In addition, the Department of Agriculture review concludes that there are no major conflicts between proposed mitigation measures and irrigation development to be achieved by the project.

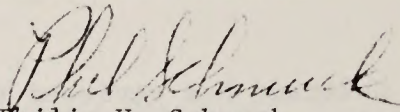
Finally, the State of Colorado is interested in the relation between the reclamation project and potential designation of a portion of the Dolores River as a national wild and scenic river. As described in the draft, there appears to be little or no conflict between the two complementary efforts, and the State of Colorado supports proceeding with both.

David L. Crandall
Page 2
January 10, 1977

The State of Colorado appreciates your willingness to extend the review deadline requested because of the unusually heavy workload of environmental impact reviews.

Sincerely,


Harris D. Sherman
Executive Director


Philip H. Schmuck
State Clearinghouse

March 7, 1977

Memorandum

To: Files

Subject: Response to Colorado Department of Natural Resources Letter of January 10, 1977, on Dolores Project Draft Environmental Statement

1. Comment:

Again as with Savery-Pot Hook, we request that the repayment contracts contain stipulations that the water rights remain dedicated to agriculture unless any proposed use is approved by the Bureau of Reclamation and the State of Colorado.

Response:

The repayment contract between the United States and Dolores Water Conservancy District will state that conversion of water from agriculture will require approval of the Secretary of the Interior with appropriate adjustments in the repayment obligation of the district. As a matter of policy the Department of the Interior would consult with the State prior to making any such conversions.

2. Comment:

Because of the number of water reclamation projects now underway or under consideration, the state is concerned about potential cumulative impacts. Therefore, we request a specific section on such impacts in the final statement, as will be prepared for the final Savery-Pot Hook EIS.

Response:

See Section C-14.



STATE OF NEW MEXICO

OFFICE OF THE GOVERNOR

SANTA FE

87503

JERRY APODACA
GOVERNOR

November 22, 1976

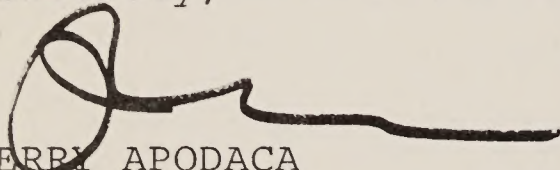
Regional Director
Bureau of Reclamation
Upper Colorado Regional Office
P. O. Box 11568
Salt Lake City, Utah 84147

Dear Sir:

By letter dated November 3 a copy of your Draft Environmental Statement on the Dolores Project, Colorado, was transmitted to me. I have asked S. E. Reynolds, State Engineer, to review the draft statement and submit any comments he finds appropriate directly to your office.

Thank you for the opportunity to review and comment on the draft statement.

Sincerely,



JERRY APODACA
Governor

JA:ser



STATE OF NEW MEXICO

STATE ENGINEER OFFICE

SANTA FE

December 22, 1976

BATAAN MEMORIAL BUILDING
STATE CAPITOL
SANTA FE, NEW MEXICO 87503

S. E. REYNOLDS
STATE ENGINEER

Mr. David L. Crandall
Regional Director
Upper Colorado Region
U. S. Bureau of Reclamation
P. O. Box 11568
Salt Lake City, Utah 84147

Dear David:

We have reviewed your Draft Environmental Statement on the Dolores Project, Colorado. The Draft Statement appears to adequately describe the environmental impacts of the proposed project. We have no other comments to offer.

Thank you for the opportunity to review and comment on the Draft Statement.

Sincerely,

A handwritten signature in dark ink, appearing to read "S. E. Reynolds", written over a horizontal line.

S. E. Reynolds
State Engineer

SER:re

STATE OF NEW MEXICO



STATE PLANNING OFFICE

GREER BUILDING
505 DON GASPER
SANTA FE, 87503
(505) 827-2073

GRACIELA (GRACE) OLIVAREZ
STATE PLANNING OFFICER

JERRY APODACA
GOVERNOR

December 22, 1976

Mr. David L. Crandall, Regional Director
Upper Colorado Regional Office
Bureau of Reclamation
P. O. Box 11568
Salt Lake City, Utah 84147

Dear Mr. Crandall:

Our office has reviewed the Draft Environmental Impact Statement on the Dolores Project in Colorado.

In general the Statement seems to cover the impacts impartially.

It would be interesting to see the number of farmers profiting from this project and the size of their holdings. This might fill a vacancy in the benefits picture, showing that the many millions expended in this project are not benefiting just a few with large land holdings.

A mention of the cost of loss to evaporation should be part of a cost-benefit analysis. If there are some studies of how the environment profits from such evaporation, this would be interesting to see.

Probably many reviewers will point out that "raptors" is consistently misspelled.

No doubt the final statement will carry the reactions of the people to be relocated.

Thank you for the opportunity to comment.

Sincerely,

Warren J. Hart

Warren J. Hart, Planner III
Natural Resources Division

WH:kV

cc: David Hale, State Engineer Office

March 7, 1977

Memorandum

To: Files

Subject: Response to New Mexico State Planning Office letter of December 22, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

It would be interesting to see the number of farmers profiting from this project and the size of their holdings. This might fill a vacancy in the benefits picture, showing that the many millions expended in this project are not benefiting just a few with large land holdings.

Response:

In Section A-4 it is pointed out that the maximum allowable farm size in single ownership would be 230 acres of class 2 land in the Dove Creek area and Montezuma Valley areas and 250 acres of class 3 land in the Montezuma Valley area. (The Dove Creek area has no significant amount of class 3 land.) Under joint ownership, a man and wife could irrigate 460 or 500 acres, respectively, of class 2 or 3 land. It is estimated that project water would initially be sold to about 140 owners in the Dove Creek area and about 500 owners in the Montezuma Valley area. In the Dove Creek area the number of ownerships is expected to increase slightly and gradually as some larger units were subdivided in compliance with land limitations. Other subdivisions would be possible as the productivity of the land increased with project development and as some large dry farms were subdivided into considerably smaller orchards and dairy farms. No significant subdivision of land is anticipated in the Montezuma Valley area. Irrigation on the Ute Reservation would be a communal endeavor and therefore be of general benefit to the entire Indian population.

2. Comment:

A mention of the cost of loss to evaporation should be part of a cost-benefit analysis. If there are some studies of how the environment profits from such evaporation, this would be interesting to see.

Response:

In the project economic analysis a cost of \$2 has been assigned to each acre-foot of stream depletion resulting from the project, including depletions from evaporation, as the project's share of costs of river regulatory facilities of the Colorado River Storage Project. In accordance with Department of the Interior policy, details of the economic analyses are not included in the environmental statement but are available in

Bureau of Reclamation offices in Salt Lake City, Utah, and Durango, Colo. The Bureau of Reclamation generally considers losses from evaporation to be unavoidable losses offset by the benefits of water storage.

3. Comment:

Probably many reviewers will point out that "raptors" is consistently misspelled.

Response:

The spelling has been changed.

4. Comment:

No doubt the final statement will carry the reactions of the people to be relocated.

Response:

The sections on relocation have been expanded, and information gained at public meetings with the people to be relocated is being used in developing the relocation plan.

Montelores PLANNING *Group*

MONTENZUMA AND DOLORES COUNTIES

Telephone (303) 565-8317

Room 303 Montezuma County Courthouse

Cortez, Colorado 81321

December 20, 1976

Philip H. Schmuck, Director
Colorado Division of Planning
1313 Sherman Street
Denver, CO 80203

RE: Dolores Project
Draft Environmental Statement

Dear Mr. Schmuck:

The Montezuma and Dolores Planning Commissions have reviewed in detail the Draft Environmental Statement for the Dolores Project in Colorado. The Commissions, in regular session, have adopted the following comments on the statement.

The Commissions do not question any of the project plan and actually endorse it. The Commissions find that the Environmental Statement is complete and clearly and correctly evaluate the project.

The Commissions did note some technical errors in the statement and offer the following corrections:

Page B-6 Section C Paragraph 3 Mineral Resource

Large portions of lands outside the McPhee Reservoir site contain varying thickness of seams of Dakota Formation coal. Much of this coal is considered commercially strippable coal. A coal resource study was done by Johnson, Barge and Latch in 1976 for Montezuma and Dolores Counties. See "Mineral Resources and Geologic Hazards Study, Montezuma and Dolores Counties, Colorado". Significant amounts of the lands in the project area have been designated as "Mineral Resource Areas" and thereby regulated for land use changes by the two counties.

Page B-11 Paragraph 3

Municipal and comestic water for the City of Cortez, Towaoc and one rural water district is delivered through the existing Dolores Tunnel under a contract with Montezuma Valley Irrigation Company.

Page Two

Page B-43 a Population Paragraph 1

"The rural population in Montezuma County is primarily located in the irrigated section of the county."

Page B-43 a Population Paragraph 3

Much of the decline of the population from 1960 to 1970 was attributed to the out-migration of those active in the oil and gas exploration of the area.

Page B-45

The population of Montezuma and Dolores Counties is expected to grow at a 2.5% annual rate. The forecast was made by the Montelores Planning Group in 1971. In 1976 this rate was verified by an analysis of the electric utility connections for the area. Population forecasts for the two counties to the year 2000 is 35,000.

Page B-46 C. Employment and Incomes

The U. S. Bureau of Labor Statistics lists Montezuma County with an unemployment rate of 8.5% March, April and May of 1976. Dolores County had an unemployment rate of 5.9%. The level of per capita income for Montezuma County in 1972 is listed at \$2,857 and Dolores County as \$3,043.

Page B-47 E. Industrial Resource Base

(1) The Montelores Sub-Region Economic Base Study shows agriculture being the principal employer for the region with 22.3% of all employment in 1970. Government employment was 19.5% and retail trade was 16.9%. This study is quoting figures from the Colorado State Division of Employment.

Page B-51 F. (1) Education

There are four senior high schools, four junior high schools in the area.

Page B-52 (2)

Add police departments in Dolores and Mancos.

Add fire stations at Pleasant View and Lewis.

Page Three

Page B-54 Paragraph 2

Delete the market terminal for livestock being
La Junta.

Page B-54 (5) Health Services

There is a medical clinic in Dolores.

We respectfully submit these corrections for your consid-
eration.

Very truly yours,

David M. Denton
Coordinator

DMD/lmc

cc: David L. Crandall
Regional Director
Bureau of Reclamation

March 7, 1977

Memorandum

To: Files

Subject: Response to Montezuma and Dolores Planning Commissions,
December 20, 1976, Letter on Dolores Project Draft
Environmental Statement

1. Comment:

Page B-6 Section C Paragraph 3 Mineral Resource

Large portions of lands outside the McPhee Reservoir site contain varying thickness of seams of Dakota Formation coal. Much of this coal is considered commercially strippable coal. A coal resource study was done by Johnson, Barge and Latch in 1976 for Montezuma and Dolores Counties. See "Mineral Resources and Geologic Hazards Study, Montezuma and Dolores Counties, Colorado". Significant amounts of the lands in the project area have been designated as "Mineral Resource Areas" and thereby regulated for land use changes by the two counties.

Response:

Coal seams of the Dakota Sandstone which were encountered during drill hole exploration of the Dolores Project features ranged from about 4 to 12 feet in thickness and were a generally low-grade, subbituminous coal which was often soft, crumbly, fragmented, and sometimes interbedded with carbonaceous shale. Because of the generally poor quality of the coal, it was not considered as a likely economical source or in sufficient amounts to warrant stripping. On the other hand, as economic conditions change and energy demands increase, perhaps these deposits could become more attractive as an economic mineral resource. Sections B-3c and C-2 of the statement have been revised to show that portions of the project area have recently been designated mineral resource areas by the two counties.

2. Comment:

Page B-11 Paragraph 3

Municipal and domestic water for the City of Cortez, Towaoc and one rural water district is delivered through the existing Dolores Tunnel under a contract with Montezuma Valley Irrigation Company.

Response:

The environmental statement has been corrected to show only one rural district receiving water through the tunnel.

3. Comment:

Page B-43 a. Population Paragraph 1

"The rural population in Montezuma County is primarily located in the irrigated section of the county."

Response:

The information has been added to the statement as suggested.

4. Comment:

Page B-43 a. Population Paragraph 3

Much of the decline of the population from 1960 to 1970 was attributed to the out-migration of those active in the oil and gas exploration of the area.

Response:

The Bureau of Reclamation agrees with this statement and has so stated in Section B-12.a.

5. Comment:

Page B-45

The population of Montezuma and Dolores Counties is expected to grow at a 2.5% annual rate. The forecast was made by the Montelores Planning Group in 1971. In 1976 this rate was verified by an analysis of the electric utility connections for the area. Population forecasts for the two counties to the year 2000 is 35,000.

Response:

Projections of population growth are determined, of course, by the premises on which the projections are made. Projections in the statement were made by the Bureau of Reclamation assisted by community and county leaders. The long-term growth rate was estimated at 1.5 percent although the rate may be exceeded for short-term intervals.

6. Comment:

Page B-46 C. Employment and Incomes

The U.S. Bureau of Labor Statistics lists Montezuma County with an unemployment rate of 8.5% March, April and May of 1976. Dolores County had an unemployment rate of 5.9%. The level of per capita income for Montezuma County in 1972 is listed at \$2,357 and Dolores County as \$3,043.

Response:

The Bureau of Reclamation uses average annual figures, and the most recent year available was 1974. Consequently, unemployment figures for a more recent, partial year (1976) or incomes for an earlier year (1972) have not been used.

7. Comment:

Page B-47 E. Industrial Resource Base

(1) The Montelores Sub-Region Economic Base Study shows agriculture being the principal employer for the region with 22.3% of all employment in 1970. Government employment was 19.5% and retail trade was 16.9%. This study is quoting figures from the Colorado State Division of Employment.

Response:

The Bureau of Reclamation is aware that different figures are available for the project area as a result of consideration of different boundaries and time periods. It has based its studies on the 1970 U.S. Census, General Social and Economic Characteristics.

8. Comment:

Page B-51 F. (1) Education

There are four senior high schools, four junior high schools in the area.

Response:

The information has been added to the statement as suggested.

9. Comment:

Page B-52 (2)

Add police departments in Dolores and Mancos.

Add fire stations at Pleasant View and Lewis.

Response:

The information has been added as suggested.

10. Comment:

Page B-54 Paragraph 2

Delete the market terminal for livestock being La Junta.

Response:

The reference to La Junta as the livestock market terminal has been deleted.

11. Comment:

Page B-54 (5) Health Services

There is a medical clinic in Dolores.

Response:

This information has been added to the statement as suggested.

c. Comments from Organizations

Colorado White Water Association

Colorado Rivers

Four Corners Expeditions

Island Foundation

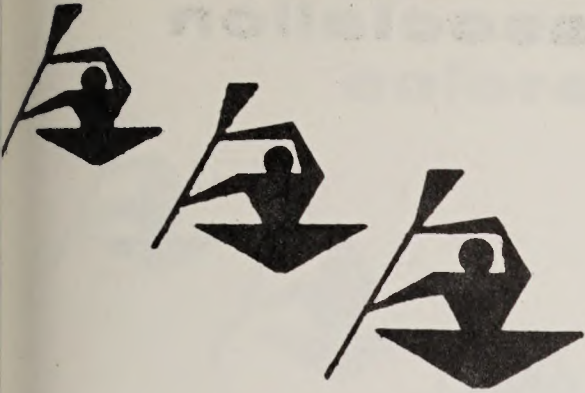
San Juan Board of Cooperative Services

San Juan Ecological Society, Inc.

Sierra Club, Rocky Mountain Chapter

Upper Colorado River Commission

colorado white water association



Dec. 13, 1976

David L. Crandall, Regional Director
Upper Colorado Regional Office
Bureau of Reclamation
Department of the Interior
Salt Lake City, Utah

Dear Mr. Crandall:

The Colorado Whitewater Association appreciates the opportunity to review the DEIS on the Dolores Project. We note that in the main the DEIS is a competent job representing the efforts of many. We, of course, abominate the project, even as you favor it, but we have an opponent's grudging respect for the evenhanded shrewdness with which it is formulated, and an opponent's depressing sense that we may not be able to beat you on it.

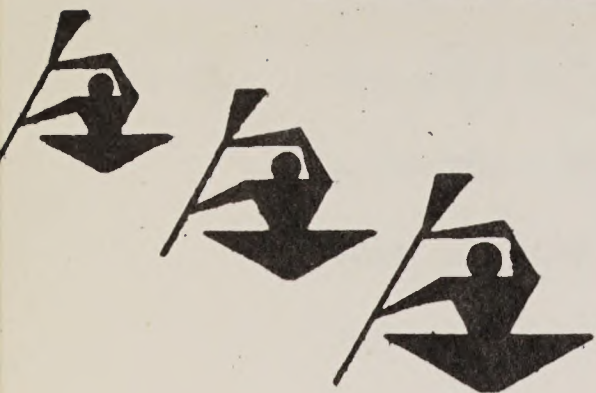
We shall take the objections we have to the DEIS in the order in which they ~~seem~~ most important.

You have announced (page B-4) that McPhee dam will be tied into the "tight" Entrada Sandstone. Either you mean the Entrada is generally free of joints, which is true; or you mean it is watertight, which we rather think is false. The work of S.W. Lohman, "Geology and Groundwater of the Grand Junction Area" (USGS Professional Paper 451, 1965) shows the Entrada to be a notable aquifer. If your geological investigations have discovered that the Entrada Sandstone at McPhee is watertight, as it is not anywhere else in the west that we know of, we suggest some data be offered to prove it. If it is not watertight, we suggest that the EIS discuss the seepage around the dam.

We note, with incredulity, your summary statement (first page) that whitewater boating will be improved by the dam. This is our particular area of expertise, and our calculations -- as well as some of yours which did not get into the DEIS -- show this to be false. You have apparently based your statements on some erroneous remarks in the Dolores Wild and Scenic River Study, in which it is stated that "management cannot encourage boating on such flows (over 2500 cfs)". This bit of statistical legerdemain has allowed you the tendentious remark above. For by expelling all boating days above 2500 cfs, you turn a great boating year into a bad one. In 1973 and 1975, when the river was runnable for 90 days or more, you claim, by this statistical trick, that it was runnable only five or ten days. Now, the original statement may be true, for we have no idea what "management" may take it in mind to do. We know, however, that flows above

PADDLING SPORT ON COLORADO'S WHITE-WATERWAYS

colorado white water association



2500 cfs are more fun to run, and safer for inadvertant swimmers. Our professional and private members alike are agreed that flows over 2500 cfs are safer than those below.

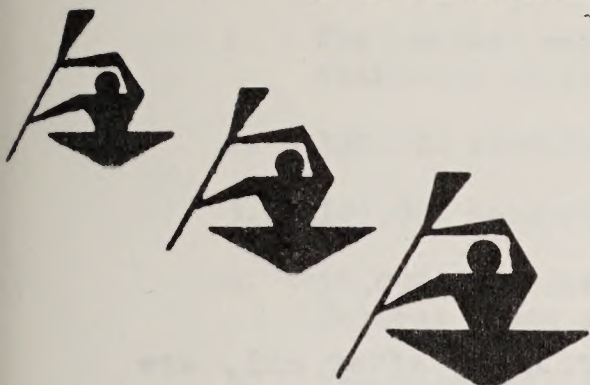
On page A-17, we find a table of river flows with and without the project for normal (1962), wet (1942), and dry (1959) years. Only in the wet year (and we note that 1942 was the wettest year recorded in the past 75 years for the Dolores, not an "average" wet year) was there any evidence of river running potential. Our experience and the available flow records indicate to us that operation of this project in any way which remotely approaches its published objectives would greatly reduce the available boating days. We do not have the resources of Burec; we do not have access to either their computer or the daily flow data needed to model this project; but by making some simple assumptions we have analyzed the operation of this project and our results show that it will greatly reduce boating opportunities on the Dolores. Our conclusions directly oppose those stated in the DEIS; we feel that the method of analysis used was chosen solely to minimize present boating opportunities. We attach a copy of the calculations we have made, and the assumptions used.

These calculations show that 1) far from improving whitewater boating, the dam will basically eliminate it for periods of up to six years, when it is now possible seven years out of every eight; 2) far from improving whitewater boating, the dam will diminish the average season to a third what it is now (about 49 annual days to 15); 3) far from improving the whitewater boating, the dam will diminish flows from the highs now available about once every five years, to levels at which the Dolores is marginally boatable, and certainly not as exciting. What this project actually does is reduce the river's boating flow to roughly one-half and claim this is an improvement because the flows are predictable.

We doubt it. Passign over the fact that our members have already been stranded by the predictable flows from your computer, both in Lodore and in Grand Canyon, we would like to point out that the vagaries of nature on the Dolores are fully predictable as is; a fact which you make use of when performing your controlled releases before the meltwater arrives. During those years when the snowpack is very low, we boat early or not at all. When it is high, we know we can run from late April to the middle of July, and we do. To put it somewhat flippantly, our prescience has been fully adequate in dealing with the mind of God and the irrigation of the MVIC; we have no evidence to suspect we will do better dealing with you.

You have ignored another impact of the dam on boating. We infer that

colorado white water association



you have relied on the Dolores study report, but have not, however, noted the projected management plan in that report. That plan will require permits to boat the river. With the dam in place, applications for those permits will accumulate for the years between spills, and the boaters will pour through the canyon in the years they can. Many will probably be turned away, unless the BLM decides to accede to the demand. Either way, we note relatively severe impacts (not improvements) on boating, and we do not see these impacts discussed. The dam insures a flood of applications; without it, the boating pressure is gradually spread over many more years and many more days. With it, professional and private alike will have no way to plan trips; professionals, in particular, need months of lead time for their advertising, and will have to offer trips they will be unable to take. The DEIS mentions none of this.

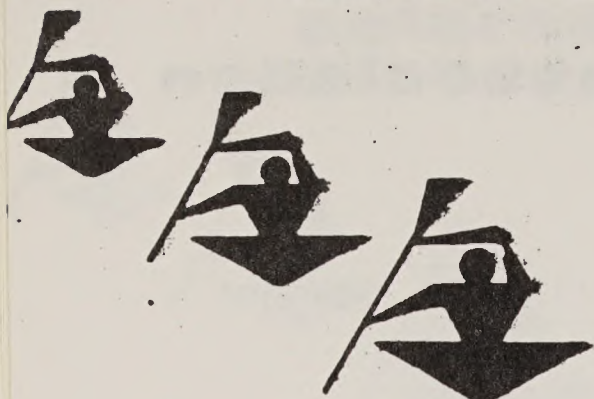
A rather blatant distortion of fact appears in your discussion of the current environment (page B-9). The statement is made that the river dries up at the dam site every 14 or 15 years. The implication is that there is no water in the watershed. In fact, there is plenty, only existing MVIC diversions slightly upstream from the dam site have drained off the water.

We have been relatively severe in discussing the way you handled boating. Most of the DEIS seems to represent the honest effort of an agency to show the impacts its action will entail. You have either been mistaken, or you have deliberately relied on statistical sleight of hand in treating the impact of your proposed dam on boating. This is a considerable blot on an otherwise fairly good DEIS, and we trust the final statement will bring the quality of its treatment of boating impacts up to the level of its other discussions. In particular, we ask you to provide an appendix in the final EIS indicating 1) the sources of the data used, and the data itself if it is not available to the general public; 2) a list of all assumptions made regarding boating; 3) a brief discussion of the model used to make the predictions, and a source for the model if it is public domain.

We realize that a great number of statements in any EIS will be controversial to some irritable type or another; discussion of all possible controversial points might expand the EIS to an ungainly size. Even recognizing this, we cannot keep from questioning the statement that the dam will garner \$50,000 a year in flood control benefits, attributed to a Corps of Engineers estimate (page C-2). Now come on, boys, fair is fair. Are you talking about the same river we are? It is very difficult for us to think of those sandstone walls, those three bridges near Slickrock, the federally owned groves of ponderosa, box elder, and willows, suffering

PADDLING SPORT ON COLORADO'S WHITE-WATERWAYS

colorado white water association



\$5,000,000 in damage over the next 100 years. The bridges, after all, are neither plated in gold nor studded with rubies. If you have a good project with convincing benefits, claim them. But don't set yourselves up to ridicule by trying to snarf up every chip in the game. You will find, if you keep on trying to show the public five aces, when four would have been enough, that the public will start checking your sleeves and pockets during every game.

Respectfully yours,

A handwritten signature in black ink, appearing to read 'Gary Aitken'. The signature is fluid and cursive, with a large, sweeping 'G' and 'A'.

Gary Aitken
Conservation Chairman
Colorado Whitewater Association
1004 Marshall Road
Boulder, Colorado
80303

Boating Opportunities on the Dolores River with and without McPhee Dam

For the following analysis, the assumptions used are itemized below.

1. The project was hypothetically built in 1922, the first year following which we had continuous monthly flow data.
2. 130,000 acre-feet was assumed to be diverted annually by MVIC.
3. 127,000 acre-feet was assumed for Dolores Project diversions.
4. 10,000 acre-feet annual contribution was assumed between the Dolores gauge site and the McPhee dam site.
5. The reservoir capacity was assumed to be 381,000 acre-feet.
6. In any one year, if the project must make boating releases of 0-60,000 acre-feet, the average release would be 1,000 cfs. This average flow would increase as annual releases increased according to the figures shown below.

<u>release (acre-feet)</u>	<u>average flow (cfs)</u>
0 - 60,000	1,000
61,000 - 120,000	1,500
121,000 - 180,000	2,000
181,000 - 240,000	2,500
241,000 -	3,000

7. People will not put in for a boating trip if it is less than ~~five~~ days until the announced end of a 1,000 cfs release.
8. The MVIC diversion without the McPhee dam would average 350 cfs. Although this flow varies widely, we do not have access to data which would give us a more accurate estimate on a monthly basis.
9. People will put in for a boating trip on the free-flowing river on any day in which the flow is 1,000 cfs or greater after taking the MVIC diversion into account, and if there is a reasonable likelihood of finishing the trip on 500 cfs or more.

Given the above constraints, the total number of boating-days (defined as any day where a launch could take place) for non-project conditions were determined by examining monthly flow data for the river and estimating the length of the boating season. From 1961 to 1974, daily flow information was also available. Our figures are still based on monthly averages for this period; however, a careful check of daily flow information confirmed the applicability of our method.

For project conditions, the reservoir storage volume at the end of each water-year were calculated. To this was added the yearly inflow, and a total of 257,000 acre-feet was subtracted for diversions (assumptions 2 and 3 above). When the resulting figure exceeded 381,000 acre-feet, the excess was carried as boating releases. This excess, divided by two acre-feet/(cfs-day) gives a figure for the number of boating days under ideal conditions (1,000 cfs release). We then applied the appropriate factor from assumption 6 and subtracted four days from the result due to the impossibility of navigation following a flow reduction (assumption 7). The table on the following page gives these results.

The conclusions are obvious. The project will result, even under the very best conditions (all releases at 1,000 cfs), in a reduction of boating opportunities from 49 days to 31 days in an average year. Under more realistic conditions of releases increasing with the magnitude of the runoff, the reduction is from 49 to 23.

Boating Opportunities with and without Dolores Project

year	beg. res. 1,000 acre- feet	inflow 1,000 acre- feet	release 1,000 acre- feet	end. res. 1,000 acre- feet	boating excess 1,000 acre- feet	# days ideal cond.	# days realistic cond.	# days natural cond.
1922	000	495	257	238	000	00	00	70
1923	238	504	257	381	104	43	31	65
1924	381	353	257	331	96	44	28	75
1925	381	323	257	381	66	29	13	40
1926	381	543	257	381	236	139	44	90
1927	381	527	257	381	270	131	41	90
1928	381	346	257	381	39	41	26	60
1929	381	403	257	381	146	69	33	60
1930	381	315	257	381	53	25	25	75
1931	381	140	257	264	0	0	0	0
1932	264	463	257	381	189	91	34	90
1933	381	223	257	347	0	0	0	40
1934	347	112	257	202	0	0	0	0
1935	202	316	257	261	0	0	0	45
1936	261	301	257	305	0	0	0	60
1937	305	377	257	331	44	13	13	75
1938	381	436	257	381	179	36	32	90
1939	381	202	257	326	0	0	0	30
1940	326	226	257	295	0	0	0	30
1941	295	532	257	381	189	91	34	60
1942	381	582	257	381	325	159	50	90
1943	381	335	257	381	78	35	22	30
1944	381	458	257	331	201	96	36	60
1945	381	338	257	381	31	36	23	60
1946	381	226	257	350	0	0	0	30
1947	350	326	257	381	38	15	15	50
1948	381	399	257	381	142	67	32	70
1949	381	383	257	381	131	66	29	60
1950	381	243	257	367	0	0	0	45
1951	367	149	257	259	0	0	0	0
1952	259	503	257	381	124	58	27	90
1953	381	205	257	329	0	0	0	30
1954	329	166	257	238	0	0	0	10
1955	238	213	257	194	0	0	0	30
1956	194	207	257	144	0	0	0	30
1957	144	514	257	381	20	6	6	90
1958	381	434	257	331	177	35	40	30
1959	331	226	257	350	0	0	0	0
1960	350	294	257	381	6	0	0	75
1961	381	240	257	364	0	0	0	30
1962	364	321	257	381	47	20	20	60
1963	381	134	257	303	0	0	0	10
1964	381	205	257	329	0	0	0	30
1965	329	409	257	381	100	46	29	60
1966	381	278	257	381	21	7	7	30
1967	381	138	257	312	0	0	0	0
1968	312	305	257	360	0	0	0	60
1969	360	322	257	381	44	18	18	45
1970	381	302	257	381	45	19	19	40
1971	381	274	257	381	17	4	4	30
1972	381	189	257	313	0	0	0	0
1973	313	514	257	381	189	91	34	60
1974	381	177	257	301	0	0	0	20
total						1640	775	2600
yearly average						31	15	49

January 21, 1977

Memorandum

To: Files

Subject: Response to Colorado White Water Association Letter of December 18, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

You have announced (page B-4) that McPhee Dam will be tied into the "tight" Entrada Sandstone. Either you mean the Entrada is generally free of joints, which is true; or you mean it is watertight, which we rather think is false. The work of S. W. Lohman, "Geology and Groundwater of the Grand Junction Area" (USGS Professional Paper 451, 1965) shows the Entrada to be a notable aquifer. If your geological investigations have discovered that the Entrada Sandstone at McPhee is watertight, as it is not anywhere else in the west that we know of, we suggest some data be offered to prove it. If it is not watertight, we suggest that the EIS discuss the seepage around the dam.

Response:

The use of "tight" was not intended to imply that the formation is absolutely watertight. Water percolation tests in exploratory drill holes at the dam site indicated that the sandstone is relatively tight in the sense that normal grouting procedures would prevent any possible seepage.

2. Comment:

We note, with incredulity, your summary statement (first page) that whitewater boating will be improved by the dam. This is our particular area of expertise, and our calculations -- as well as some of yours which did not get into the DEIS -- show this to be false. You have apparently based your statements on some erroneous remarks in the Dolores Wild and Scenic River Study, in which it is stated that "management cannot encourage boating on such flows (over 2500 cfs)". This bit of statistical legerdemain has allowed you the tendentious remark above. For by expelling all boating days above 2500 cfs, you turn a great boating year into a bad one. In 1973 and 1975, when the river was runnable for 90 days or more, you claim, by this statistical trick, that it was runnable only five or ten days. Now, the original statement may be true, for we have no idea what "management" may take it in mind to do. We know, however, that flows above 2500 cfs are more fun to run, and safer for inadvertant swimmers. Our professional and private members alike are agreed that flows over 2500 cfs are safer than those below.

Response:

The statement has been revised to show a reduction in white-water boating under project conditions, as presented on pages I-18 and I-19 in response to comment No. 5. Boating use would decrease from an estimated 2,805 boater-days annually to between 1,333 and 1,937 boater-days annually. These figures are based on the definition of boating flows as the occurrence of 500 second-feet or more during runoff from snowmelt.

3. Comment:

On page A-17, we find a table of river flows with and without the project for normal (1962), wet (1942), and dry (1959) years. Only in the wet year (and we note that 1942 was the wettest year recorded in the past 75 years for the Dolores, not an "average" wet year) was there any evidence of river running potential. Our experience and the available flow records indicate to us that operation of this project in any way which remotely approaches its published objectives would greatly reduce the available boating days. We do not have the resources of Burec; we do not have access to either their computer or the daily flow data needed to model this project; but by making some simple assumptions we have analyzed the operation of this project and our results show that it will greatly reduce boating opportunities on the Dolores. Our conclusions directly oppose those stated in the DEIS; we feel that the method of analysis used was chosen solely to minimize present boating opportunities. We attach a copy of the calculations we have made, and the assumptions used.

These calculations show that 1) far from improving whitewater boating, the dam will basically eliminate it for periods of up to six years, when it is now possible seven years out of every eight; 2) far from improving whitewater boating, the dam will diminish the average season to a third what it is now (about 49 annual days to 15); 3) far from improving the whitewater boating, the dam will diminish flows from the highs now available about once every five years, to levels at which the Dolores is marginally boatable, and certainly not as exciting. What this project actually does is reduce the river's boating flow to roughly one-half and claim this is an improvement because the flows are predictable.

We doubt it. Passing over the fact that our members have already been stranded by the predictable flows from your computer, both in Lodore and in Grand Canyon, we would like to point out that the vagaries of nature on the Dolores are fully predictable as is; a fact which you make use of when performing your controlled releases before the meltwater arrives. During those years when the snowpack is very low, we boat early or not at all. When it is high, we know we can run from late April to the middle of July, and we do. To put it somewhat flippantly, our prescience has been fully adequate in dealing with the mind of God and the irrigation of the MVIC; we have no evidence to suspect we will do better dealing with you.

Response:

Boating flows and use have been significantly revised, as discussed on pages I-18 and 19 in response to comment No. 5. The statement now indicates that the project would reduce use from the present average of 2,805 boater-days annually to about 1,333 to 1,937 boater-days annually.

4. Comment:

You have ignored another impact of the dam on boating. We infer that you have relied on the Dolores study report, but have not, however, noted the projected management plan in that report. That plan will require permits to boat the river. With the dam in place, applications for those permits will accumulate for the years between spills, and the boaters will pour through the canyon in the years they can. Many will probably be turned away, unless the BLM decides to accede to the demand. Either way, we note relatively severe impacts (not improvements) on boating, and we do not see these impacts discussed. The dam insures a flood of applications; without it, the boating pressure is gradually spread over many more years and many more days. With it, professional and private alike will have no way to plan trips; professionals, in particular, need months of lead time for their advertising, and will have to offer trips they will be unable to take. The DEIS mentions none of this.

Response:

Revisions of white-water boating estimates have been outlined in response to comment No. 5 on pages I-18 and 19 and indicate a reduction of 31 to 52 percent as a result of the project. Consequently, boating use would be restricted primarily from the reduced flows rather than from a program to require permits. The issuance of permits could, however, prevent boaters from pouring through the canyon in good years, since a ceiling on use may be established based upon estimates of the carrying capacity of the canyon.

Although the total number of boating days would be reduced, boaters would probably have as much lead time in wet years as they do under present circumstances, particularly with the proposed program of predicting and scheduling boating releases at McPhee Dam.

5. Comment:

A rather blatant distortion of fact appears in your discussion of the current environment (page B-9). The statement is made that the river dries up at the dam site every 14 or 15 years. The implication is that there is no water in the watershed. In fact, there is plenty, only existing MVIC diversions slightly upstream from the dam site have drained off the water.

Response:

The statement has been modified to clarify the fact that transbasin diversions above the site dry up the stream.

6. Comment:

We have been relatively severe in discussing the way you handled boating. Most of the DEIS seems to represent the honest effort of an agency to show the impacts its action will entail. You have either been mistaken, or you have deliberately relied on statistical sleight of hand in treating the impact of your proposed dam on boating. This is a considerable blot on an otherwise fairly good DEIS, and we trust the final statement will bring the quality of its treatment of boating impacts up to the level of its other discussions. In particular, we ask you to provide an appendix in the final EIS indicating 1) the sources of the data used, and the data itself if it is not available to the general public; 2) a list of all assumptions made regarding boating; 3) a brief discussion of the model used to make the predictions, and a source for the model if it is public domain.

Response:

The background material and basic assumptions used in the revised estimates of boating are considered too detailed for inclusion in this statement but are available for inspection in Bureau of Reclamation offices in Salt Lake City and Durango.

7. Comment:

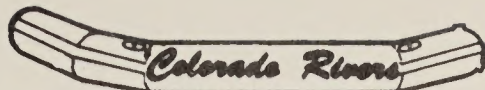
We realize that a great number of statements in any EIS will be controversial to some irritable type or another; discussion of all possible controversial points might expand the EIS to an ungainly size. Even recognizing this, we cannot keep from questioning the statement that the dam will garner \$50,000 a year in flood control benefits, attributed to a Corps of Engineers estimate (page C-2). Now come on, boys, fair is fair. Are you talking about the same river we are? It is very difficult for us to think of those sandstone walls, those three bridges near Slickrock, the federally owned groves of ponderosa, box elder, and willows, suffering \$5,000,000 in damage over the next 100 years.

Response:

As stated in Section C-13.i., the average annual flood control benefits of \$50,000 were estimated by the Corp of Engineers and are divided between two reaches of the Dolores River:

1. From the McPhee Dam to the mouth of the San Miguel River, \$4,800
2. From the mouth of the San Miguel River to the mouth of the Dolores River, \$45,200.

These estimates are based upon historical and potential damage to agricultural property and structures, residential property, business property, highways and roads and associated bridges, utilities, irrigation works, and agricultural property.



Durango, Colorado P.O. Box 1386
Reservations: Phone (303) 259-0708

December 13, 1976

David L. Grandall
Regional Director
Upper Colorado Regional Office,
Bureau of Reclamation
Department of the Interior
Salt Lake City, Utah

RE: Response To Draft Enviromental Impact Statement - DES
76-44 on the Dolores Project.

Dear Sirs:

As a businessman that depends on the Dolores River for a substantial portion of my annual revenues, I appreciate the opportunity to comment on the DEIS for the Dolores Project. I have studied the DEIS carefully and feel that it contains numerous oversights as to how the Project will actually affect the river tour industry as well as non-commercial river runners on the Dolores River. I cite the following points for consideration:

1) Page A-34--I feel these figures that show river access as improved for public use for the purpose of river travel to be in error. As I understand, the information for what constitutes a "river access day" was developed from judgements volunteered by the Colorado Whitewater Association. They suggested downstream flows of 1000 to 2500 cfs would be acceptable for whitewater boating. However, flows above and below that stage are useable for river travel. Practical access, in fact, can be provided at flows as low as 500 cfs and certainly above 2500 cfs as measured at McPhee.

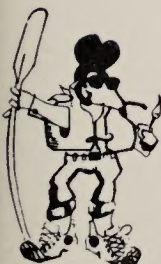
QUESTION: Have all the potential use days when the river was below 1000 and above 2500 cfs been disregarded for determining river access days? It is crucial that the DEIS reflect a realistic base line of potential access days.

2) Page B-50 states that use days are adversely affected by the lack of predictability of daily flows. The logic used in this statement is questionable as base flows, weather, and number of weekends available during the "season" are most relevant to actual use.

QUESTION: Since there was at least one commercial trip daily

"I Say Beware of All Enterprises That Require New Clothes"
Henry David Thoreau

Member of Western River Guides, Assn.



on the river from April 20 through June 10, in 1976, how could DEIS reaserch have arrived at the 800 user day figure when user days were no doubt in excess ~~ten times~~ of that?

3) Page A-34 presents some interesting contradictions that I feel should be clarified. The graph shows water enough for boating in the wet year, but inadequate releases in "normal" or "dry" years. Experience has told me that there are more dry and normal years than there are wet; yet it is stated in the first paragraph of page A-34 that we will have a net increase of user days with the Project in operation.

QUESTION: How does the arithmetic of increased user days from less water make sense? If this is the case, how many of those increased user days will be in April and early May and therefore little used?

4) Pages I-1-I-4, the consultation section, does not contain any reference as to information sought from the river tour industry, any organization representing that industry or organizations representing the non-commercial river runner.

QUESTION: How can the DEIS suggest that boating will be enhanced and releases will be scheduled to benefit recreational river users, if no meaningful input from that sector has been considered in its preparation?

5) Page A-11, table A-3.

QUESTION: Why was no discussion of the reservoir's surcharge capacity and its utilization and management for recreational uses addressed in the DEIS? The final DEIS should also contain a discussion of unused municipal, industrial and other allocated but unused storage capacity that could be utilized for down stream recreation until actual demand necessitates its withdrawal.

6) Page B-50 contains several inaccuracies and must be rewritten to reflect actual river use as follows:

A. There is virtually an annual opportunity to use the river as a transportation means through the Dolores ecosystem (the given 7 out of 10 years is in error).

B. Fluctuation and its effect on practical boating is discussed in my comments above, and is in need of reassessment.

C. The 800 user day estimate of river boaters is in error by a factor of at least 10. (The Montrose BLM office can produce documentation of 5000 user days in 1976. They estimate actual use in the spring of 1976 was twice that.)

D. River use has grown at an astounding rate, as many other rivers are rationed as to user day access and the resultant frustrated demand has focused on rivers such as the Dolores which is creating at least a 100% per year user day growth curve. A reassessment of future projected growth without the Project must be undertaken for the final DEIS.

E. River touring activities on the Dolores River contribute substantially to the local economy in May and June and are showing a healthy growth rate. A comparative analysis of these benefits with and without the Project must be assessed in the final DEIS.

7) Page A-31, figure A-15--it would appear to this reader that the critically needed access areas for launch and recovery of boating should receive optimal utilization to justify their expense.

QUESTION: Since reservoir releases for boating will increase the use of these areas, why is this use not a consideration in mitigating the cost of their development. In addition, a campsite should be considered for construction at the site of Snaggletooth Rapid as many portages there involve overnight camping and the impact of boating activities is considerable in that section of the river.

8) Page C-32, table C-9 and 10--it appears while no stone is left unturned to establish cost benefits for reservoir use and down stream fishery, no such careful study has been given to the apparent adverse effects that the Project will create for river users, both commercial and non profit.

QUESTION: Why has no research been done as to possible adverse economic effects to outfitters and lost revenues to area support businesses?

9) Page E-1-E-2--river running will be totally impossible in the years the reservoir is filling.

QUESTION: How are the revenues lost to the river tour industry to be factored in for these years?

Dolores Project
December 13, 1976
Page 4

10) Page H-11--the non-development option should be re-written to read "river flows would remain uncontrolled and would be utilized at the optimum level that recreational demands and enviromental demands under an inevitable river management plan will allow.

QUESTION: Is non-development not in the river tours industry's best interest?

The above statements and questions are intended to build a case that the research as to the Dolores Project's affect on downstream recreational boating and its economic benefits have been inadequately considered. I trust that these essential interests will not be disregarded in the final DEIS.

I welcome any opportunity to assist in providing realistic input.

Sincerely,

Preston B. Ellsworth

Preston B. Ellsworth
Outfitter
COLORADO RIVERS

January 21, 1977

Memorandum

To: Files

Subject: Response to Colorado Rivers Letter of December 13, 1976,
on Dolores Project Draft Environmental Statement

1. Comment:

Page A-34--I feel these figures that show river access as improved for public use for the purpose of river travel to be in error. As I understand, the information for what constitutes a "river access day" was developed from judgements volunteered by the Colorado Whitewater Association. They suggested downstream flows of 1000 to 2500 cfs would be acceptable for whitewater boating. However, flows above and below that stage are useable for river travel. Practical access, in fact, can be provided at flows as low as 500 cfs and certainly above 2500 cfs as measured at McPhee.

QUESTION: Have all the potential use days when the river was below 1000 and above 2500 cfs been disregarded for determining river access days? It is crucial that the DEIS reflect a realistic base line of potential access days.

Response:

As discussed on pages I-18 and 19 in response to comment No. 5, boating use has been revised to consider flows of 500 second-feet and above.

2. Comment:

Page B-50 states that use days are adversely affected by the lack of predictability of daily flows. The logic used in this statement is questionable as base flows, weather, and number of weekends available during the "season" are most relevant to actual use.

QUESTION: Since there was at least one commercial trip daily on the river from April 20 through June 10, in 1976, how could DEIS research have arrived at the 800 user day figure when user days were no doubt in excess ten times of that?

Response:

The environmental statement has been revised, as pointed out on pages I-18 and 19, comment No.5, to remove any implication that existing boater use is adversely affected by lack of predictability. Existing use is estimated at an average of 2,805 days annually, based upon updated information provided by Bureau of Land Management figures for 1976 boating.

3. Comment:

Page A-34 presents some interesting contradictions that I feel should be clarified. The graph shows water enough for boating in the wet year, but inadequate releases in "normal" or "dry" years. Experience has told me that there are more dry and normal years than there are wet; yet it is stated in the first paragraph of page A-34 that we will have a net increase of user days with the Project in operation.

QUESTION: How does the arithmetic of increased user days from less water make sense? If this is the case how many of those increased user days will be in April and early May and therefore little used?

Response:

As stated in answer to question No. 5 on Pages I-18 and 19, the environmental statement has been modified to show decrease of 31 to 42 percent in boater-days resulting from the project.

4. Comment:

Pages I-1-I-4, the consultation section, does not contain any reference as to information sought from the river tour industry, any organization representing that industry or organizations representing the non-commercial river runner.

QUESTION: How can the DEIS suggest that boating will be enhanced and releases will be scheduled to benefit recreational river users, if no meaningful input from that sector has been considered in its preparation?

Response:

The environmental statement has been revised to specify that the project would have an adverse impact on boating (See the response to Comment No. 5 on Pages I-18 and 19).

5. Comment:

Pages A-11, Table A-3.

QUESTION: Why was no discussion of the reservoir's surcharge capacity and its utilization and management for recreational uses addressed in the DEIS? The final DEIS should also contain a discussion of unused municipal, industrial and other allocated but unused storage capacity that could be utilized for down stream recreation until actual demand necessitates its withdrawal.

Response:

The surcharge capacity would be provided to ensure the safe operation of McPhee Dam during large floods and must be available solely for this purpose. The use of this reserved capacity for other reasons could jeopardize the safety of the dam.

Before the beginning of project construction, repayment contracts must be signed by the United States and the water users for the irrigation and municipal and industrial water. Consequently, the Bureau would not have the prerogative of temporarily reallocating any of the water supplies not immediately needed by the users.

6. Comment:

Page B-50 contains several inaccuracies and must be rewritten to reflect actual river use as follows:

A. There is virtually an annual opportunity to use the river as a transportation means through the Dolores ecosystem (the given 7 out of 10 years is in error).

B. Fluctuation and its effect on practical boating is discussed in my comments above, and is in need of reassessment.

C. The 800 user day estimate of river boaters is in error by a factor of at least 10. (The Montrose BLM office can produce documentation of 5000 user days in 1976. They estimate actual use in the spring of 1976 was twice that.)

D. River use has grown at an astounding rate, as many other rivers are rationed as to user day access and the resultant frustrated demand has focused on rivers such as the Dolores which is creating at least a 100% per year user day growth curve. A reassessment of future projected growth without the Project must be undertaken for the final DEIS.

E. River touring activities on the Dolores River contribute substantially to the local economy in May and June and are showing a healthy growth rate. A comparative analysis of these benefits with and without the Project must be assessed in the final DEIS.

Response:

As pointed out on pages I-18 and 19, project estimates have been revised to show an adverse impact on boaters. Boating use, which is now available in nearly every year and averages 2,805 boater-days annually, would be reduced to between 1,333 and 1,937 boater-days annually.

The Bureau is not aware of any data to substantiate a growth rate of 100 percent annually in boating use. (The only data available are for 1976, and one year is insufficient as a base for projections of future growth). If such a rate of growth is occurring, however, it is assumed that it will be short-lived since a continuation would result in 205,000 boater days by 1982, or 3,725 boaters on every launching day of an average runoff year. Such a high rate of use would no doubt be prohibited by the agency responsible for administering the river corridor.

In accordance with Department of the Interior policy, economic analyses are not included in the environmental statement but is available in Bureau of Reclamation offices in Salt Lake City, Utah, and Durango, Colo. The Bureau is not aware of information to substantiate a significant contribution to the local economy from commercial boaters or of any such organizations headquartered in the local area.

7. Comment:

Page A-31, figure A-15--it would appear to this reader the critically needed access areas for launch and recovery of boating should receive optimal utilization to justify their expense.

QUESTION: Since reservoir releases for boating will increase the use of these areas, why is this use not a consideration in mitigating the cost of their development. In addition, a campsite should be considered for construction at the site of Snaggletooth Rapid as many portages there involve overnight camping and the impact of boating activities is considered in that section of the river.

Response:

Benefits have been estimated for the recreational developments on the river on the basis of anticipated use and justify the costs of development. Mountain Sheep Point site would be located at Snaggletooth Rapid.

8. Comment:

Page C-32, table C-9 and 10--it appears while no stone is left unturned to establish cost benefits for reservoir use and down stream fishery, no such careful study has been given to the apparent adverse effects that the Project will create for river users, both commercial and non profit.

QUESTION: Why has no research been done as to possible adverse economic effects to outfitters and lost revenues to area support businesses?

Response:

Section C.13.g. has been modified to contain a discussion of economic impacts on commercial boaters. The section is based on previous information indicating average daily charges of \$40 per boater, operating expenses of \$28, and resulting net incomes of \$12 per boater. The Bureau does not have informaton to assess the economic contribution of commercial outfitters to the local economy.

9. Comment:

Page E1-E-2--river running will be totally impossible in the years the reservoir is filling.

QUESTION: How are the revenues lost to the river tour industry to be factored in for these years?

Response:

The Bureau of Reclamation recognizes as an unavoidable adverse effect the fact that white-water boating would probably not be possible while McPhee Reservoir was filling and that revenues would be lost as a result.

10. Comment:

Page H11-the non-development option should be rewritten to read "river flows would remain uncontrolled and would be utilized at the optimum level that recreational demands and environmental demands under an inevitable river management plan will allow.

QUESTION: Is non-development not in the river tours industry's best interest?

Response:

The statement in Section H-4 has been modified as suggested to indicate that boating opportunities would be greater without development of the proposed project.

Four Corners Expeditions



December 18, 1976

Mr. David L. Crandall
Regional Director
Upper Colorado Regional Office
Bureau of Reclamation
Post Office Box 11568
Salt Lake City, Utah 84147

Dear Mr. Crandall:

As a person who lived and worked in Montezuma County from 1974-76 and who now makes part of my living from the Dolores River, I feel compelled to comment on the Draft Environmental Impact Statement of the Dolores Project. First, as a private river rafter and now as a professional river outfitter and owner of Four Corners Expeditions, I have acquired a deep personal love and respect for the Dolores River and feel a need to discuss the draft statement. I would like to divide my comments into two sections, discussion of facts and conclusions of the statement and my opinions.

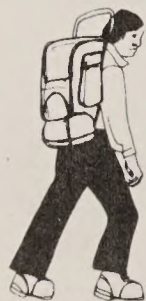
I. Discussion of the facts and conclusions:

Recreation: The draft says the project will improve whitewater boating. How can this be when Table A-14 shows no boating days for normal or dry years? Although I don't know what actual flows for 1976 were, I do know that snowpack was slightly below normal for 1976. However, we had a minimum of 41 consecutive boating days from the Bradfield Ranch to Bedrock this year. How do I know? I was on the river at least twice a week from April 26-June 6 and the river was always runnable. Without the project we would always have some rafting days. With the project, only wet years would provide rafting days.

Figure A-15 says launch sites will be developed at the following sites for one-day trips: Williams Draw, Mt. Sheep Point, Slickrock, Little Gypsum Valley, and Bedrock. As the only outfitter running one-day float trips on the Dolores, I feel many boaters would really have to push it to make the above destinations at flows below 1500 cfs.

The draft says 800 boater days are presently being used with an increase to 1200 in 50 years. If you check with the Montrose office of BLM I am sure you will find that boater use greatly exceeded 800 boater days this year. I personally know of more than 800 boater days in 1976 and the Draft Impact Statement for the Dolores Wild and Scenic River study states that the 94-mile stretch from Bradfield to Bedrock already receives 2500 visitor days (pg. III-3). To summarize, you have

....continued



BUREAU OF RECLAMATION
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greatly underestimated boater use on the Dolores below McPhee. It appears the dam would greatly reduce whitewater boating by eliminating use during normal and dry years.

Project Life: You have not addressed the impact of the project after it outlives its usefulness; that is, when it silts up to the point where it will no longer function as a reservoir. You don't even mention the life of the project. As you know, Lake Powell is silting up faster than expected.

Construction Timetable: It will take six years to build the dam. You have not addressed the impact of construction on downstream flows. You allow only two years for the archeology program. Two years to test and excavate 69 sites?

Drawdown: How will an annual drawdown of 25 feet, 12 feet alone in July, affect the proposed fishery? Also, how will 11,000 acre-feet of silt affect said fishery?

Wildlife and fishery: The draft states the project will destroy 10,000 acres of blackfooted ferret habitat. More studies need to be made to determine whether this animal exists in the affected area. Future management plans for the mountain lion call for an increase in the population. Stabilization of the blackbear population is also planned. Not enough information has been gathered to determine the project's affect on these animals. Isn't more research necessary?

Salt Problem: The amount of salt increase in the San Juan River will be from 4-26%, in the Colorado 1.1%. What affect will this have on the environment below Lee's Ferry? This needs to be considered and hasn't been. Not only will there be an added dollar cost, but all farms and ranches irrigating with Colorado River water will be affected; and what about the affect in Mexico?

Geology: Could the House Creek Fault become active? What do you consider "only minor damage" due to seismic activity? Could repeated seismic activity cause the dam to rupture? Have you determined the consequences of another Teton Dam disaster? What would the stream flows be if the dam were to break?

Economic and Social Conditions: You have not addressed the so-called "Indian Problem;" that is, possible litigation by the Utes for water rights and the ramifications on the local environment. Who will pay for added community facilities and services needed due to the project? Do the affected areas expect a free ride?

II. My Opinions on Varying Aspects of the Project:

Fish and Wildlife: I don't agree that a stocked fishery will create a good sport fishery below McPhee Dam. Create a natural fishery but not a stocked one. The affects on terrestrial wildlife need more study. We need to know whether blackfooted ferrets live in the affected area. Raptor losses are unacceptable. The specific affects on bears and mountain lions need to be studied.

Recreation: "The project would affect the area by fulfilling needs for recreation and leisure." I believe these needs are presently being met by existing facilities. Also, the project would provide a swimming beach - most local residents do not know how to swim!

Agriculture: Irrigation would allow more local ranches and farmers to run some type of cattle operation. Many local ranchers and farmers who irrigate now are having a hard time making a living. What makes you think more cattle operations will change that? What sense does it make to increase agricultural production in

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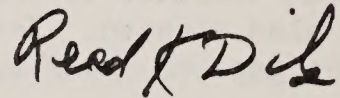
Mr. David L. Crandall
Page three

the Four Corners Area at the expense of such places as California's Imperial Valley? No sense at all. It is a simple case of the "pork barrel" in the Four Corners Area. Finally, will the new irrigation subscribers be able to pay for the cost of this project?

Cost-Benefit Ratio: Although not addressed in the draft environmental impact statement, I don't believe the project has a high enough cost/benefit ratio to be worthwhile. I understand it is already less than 1 at current discount prices and by the time construction is finished the cost/benefit ratio will have dropped even further due to inflation.

I know that government agencies have to ask for public input, but in talking with those agency officials it is apparent they just as often only go through the motions without seriously considering what the public is saying. I took the time to read this statement thoroughly, so I sincerely hope you will take the time to give these thoughts serious consideration.

Sincerely,

A handwritten signature in dark ink, appearing to read "Reed K. Dils". The signature is stylized with a large, looped "R" and a distinct "D".

Reed K. Dils

January 21, 1977

Memorandum

To: Files

Subject: Response to Four Corners Expedition, Letter of December 18, 1976, on Dolores Project Draft Environmental Statement

1. Comments:

Recreation: The draft says the project will improve whitewater boating. How can this be when Table A-14 shows no boating days for normal or dry years? Although I don't know what actual flows for 1976 were, I do know that snowpack was slightly below normal for 1976. However, we had a minimum of 41 consecutive boating days from the Bradfield Ranch to Bedrock this year. How do I know? I was on the river at least twice a week from April 26-June 6 and the river was always runnable. Without the project we would always have some rafting days. With the project, only wet years would provide rafting days.

Response:

Table A-14 should not be construed to be an indication of boating use available with the project. As stated on Pages I-18 and 19 in response to question No. 5, boating opportunities are present in nearly every year under existing conditions but would be significantly decreased with the construction of the project.

2. Comment:

Figure A-15 says launch sites will be developed at the following sites for one-day trips: Williams Draw, Mt. Sheep Point, Slickrock, Little Gypsum Valley, and Bedrock. As the only outfitter running one-day float trips on the Dolores, I feel many boaters would really have to push it to make the above destinations at flows below 1500 cfs.

Response:

The amount of time it would take a boater to run the distance between the launch sites does depend on the flow. The logic used in planning these sites is that:

(1) Each currently has road access and therefore no new roads would be necessary;

(2) These sites are now being used, and will continue to be used because of the otherwise limited access, for launching and taking out boats;

(3) In general, these sites are at 1 day intervals under normal boating conditions (flow) of the river.

The sites and facilities are planned to accommodate the increase in fishermen and other recreation users, as well as boaters, who are expected to use the river once minimum flow is insured and a fishery is established.

The Bureau's plan is not based upon requiring that boaters or others use only the facilities provided with project development.

3. Comment:

The draft says 800 boater days are presently being used with an increase to 1,200 in 50 years. If you check with the Montrose office of BLM I am sure you will find that boater use greatly exceeded 800 boater days this year. I personally know of more than 800 boater days in 1976 and the Draft Impact Statement for the Dolores Wild and Scenic River study states that the 94-mile stretch from Bradfield to Bedrock already receives 2500 visitor days (pg. III-3). To summarize, you have greatly underestimated boater use on the Dolores below McPhee. It appears the dam would greatly reduce whitewater boating by eliminating use during normal and dry years.

Response:

As indicated in response to comment No. 5 on Pages I-18 and 19, the project would reduce the use of the river from the existing average of 2,805 boater-days annually to between 1,333 and 1,937 boater-days annually. Under project conditions, only about 21 out of every 46 years would have boating flows.

4. Comment:

Project Life: You have not addressed the impact of the project after it outlives its usefulness; that is, when it silts up to the point where it will no longer function as a reservoir. You don't even mention the life of the project. As you know, Lake Powell is silting up faster than expected.

Response:

McPhee Reservoir would not be significantly affected by sediment deposits. After 100 years, only about 3 percent of the total reservoir capacity and 1 percent of the active capacity would be lost because of sediment, and proper dredging at the upper end of the reservoir could maintain the useful life of the active capacity indefinitely. Since any sediments deposited near the outlet works would be flushed downstream by water releases, the operation of the dam would not be affected.

5. Comment:

Construction Timetable: It will take six years to build the dam. You have not addressed the impact of construction on downstream flows.

Response:

The Dolores River would be diverted around the dam site during construction, and the flow would not be significantly affected. The estimated impacts on water quality are addressed in Section C.5.a.

6. Comment:

Drawdown: How will an annual drawdown of 25 feet, 12 feet alone in July, affect the proposed fishery? Also, how will 11,000 acre-feet of silt affect said fishery?

Response:

Since McPhee Reservoir would be managed primarily as a trout fishery through an annual stocking program, the drawdown would result in insignificant loss of productivity and habitat. Adverse effects of drawdown are usually associated with interference of the reproductive cycle of warm water species by exposing their eggs.

The 11,000 acre-feet of silt represents an accumulation over a 100-year period and at the end of this period would occupy about 3 percent of the total reservoir capacity. As this silt accumulated, a small decrease in productivity could be expected, particularly in the upper end of the reservoir where wave action in shallow water would increase turbidity during periods of high winds.

7. Comment:

Wildlife and fishery: The draft states the project will destroy 10,000 acres of blackfooted ferret habitat. More studies need to be made to determine whether this animal exists in the affected area. Future management plans for the mountain lion call for an increase in the population. Stabilization of the black bear population is also planned. Not enough information has been gathered to determine the project's affect on these animals. Isn't more research necessary?

Response:

The statement states that approximately 10,000 acres of Gunnison's prairie dog habitat would be affected--not destroyed. Habitat is usually defined as a place where an organism exists. Intensive survey, supervised by the U.S. Fish and Wildlife Service, on 2,600 of the 7,500 acres of land to be converted to irrigated farmland near Towaoc failed to reveal any sign of ferret activity. No ferret sightings or sign of ferret activity has been reported from this area in the past.

This habitat may be considered "potential" ferret habitat; however, natural recruitment or use of this area for future restoration of this species is unlikely.

Further project studies of wildlife are planned after the project is constructed. It is doubtful that further pre-project research would reveal data that would lead to impact analyses significantly different from those already presented.

8. Comment:

Salt Problem: The amount of salt increase in the San Juan River will be from 4-26%, in the Colorado 1.1%. What affect will this have on the environment below Lee's Ferry? This needs to be considered and hasn't been. Not only will there be an added dollar cost, but all farms and ranches irrigating with Colorado River water will be affected; and what about the affect in Mexico?

Response:

The 4-26 percent concentration in total dissolved solids in the San Juan River represents the maximum effect the project will have as discussed in Section C-5.c.(1). The effect on water quality in the Colorado River at Lee's Ferry would be substantially less than at the San Juan River at Bluff, Utah, because of the larger volume of river flows. The salt load from the Dolores Project would decrease with time, reaching no apparent effect by about the 80th year of operation.

The Bureau of Reclamation is conducting a basin-wide program to minimize salinity levels in the Colorado River system. This program was authorized by the Colorado River Basin Salinity Control Act of June 24, 1974 (Public Law 93-320). The ultimate objective is to limit any further increases in salinity while the Upper Basin States--parts of Utah, Arizona, New Mexico, Wyoming, and Colorado--continue to develop their water resources.

9. Comment:

Geology: Could the House Creek Fault become active: What do you consider "only minor damage" due to seismic activity? Could repeated seismic activity cause the dam to rupture? Have you determined the consequences of another Teton Dam disaster? What would the stream flows be if the dam were to break.

Response:

The current geologic conditions are stable and do not augur any activity from the House Creek Fault. "Only minor damage" because of seismic activity means no destructive damage or that if any damage to the dam resulted from tremors it would be slight and easily repaired. Any seismic activity in this area is not expected to impair the dam or to be frequent in occurrence. Computing a flow rate for an event such as a dam failure would be unreasonably speculative. The flow rate would be a function of unpredictable variables such as the location of rupture, the volume of water in storage, and the rate of erosion of fill material.

10. Comment:

Economic and Social Conditions: You have not addressed the so-called "Indian Problem;" that is, possible litigation by the Utes for water rights and the ramifications on the local environment.

Response:

Section B-5b of the statement has been amended to include a section on Indian water rights. The Ute Mountain Utes have not filed for water rights on the Dolores River although it is conceivable that they could since the Southern Ute Indians, under the Winters Doctrine, are seeking additional water rights in the San Juan River drainage through litigation. The impacts of the Ute Mountain Utes' seeking water rights on the Dolores River under the Winters Doctrine have not been analyzed since at the present time the question is problematic.

11. Comment:

Who will pay for added community facilities and services needed due to the project? Do the affected areas expect a free ride?

Response:

Local communities would have to provide facilities and services needed by a growing population. They may be able to receive Federal assistance in filling this need. This type of assistance may be available to rapidly growing areas no matter what the cause of their growth.

12. Comment:

Fish and Wildlife: I don't agree that a stocked fishery will create a good sport fishery below McPhee Dam. Create a natural fishery but not a stocked one. The affects on terrestrial wildlife need more study. We need to know whether blackfooted ferrets live in the affected area. Raptor losses are unacceptable. The specific affects on bears and mountain lions need to be studied.

Response:

Since a trout fishery does not presently exist below the proposed McPhee Dam site, the only sport fishery that could possibly be developed would have to be stocked. After initial stocking, stream productivity, reproductive success and fisherman harvest would determine the future management plan. It is doubtful that a fishery could be maintained through natural reproduction because of the heavy fishing pressure expected. Therefore, some type of supplemental stocking, be it a catchable or sub-catchable program, would probably be required to meet the future demands of fishermen. Some of the best trout fishing available in the United States today exists in tailwaters below Bureau of Reclamation dams and is a result of an annual, sub-catchable program of stocking.

One of the purposes of an environmental impact statement is to point out the expected impacts of the particular action. It is then up to the decisionmaker if the projected losses are acceptable or unacceptable. In the case of the Dolores Project raptor losses would be a trade off for improvements made in the aquatic environment.

An intensive survey of the prairie dog towns in the project area during the summer of 1976 by qualified experts failed to reveal any sign of the blackfooted ferrets. The estimated 50,000 acres of prairie dog habitat outside of the project area was not surveyed and there is a possibility of blackfooted ferrets being found in this area. This area, however, will not be affected by the project.

The assessment of impacts on the black bear and mountain lion is based upon studies conducted by the Colorado Division of Wildlife (see the Bibliography). It is not expected that additional studies would alter the basic estimate of the impacts.

13. Comment:

Recreation: "The project would affect the area by fulfilling needs for recreation and leisure." I believe these needs are presently being met by existing facilities. Also, the project would provide a swimming beach--most local residents do not know how to swim!

Response:

The Dolores Project would include the development of recreation facilities that are generally in accord with the Colorado State Comprehensive Outdoor Recreation Plan (SCORP). The swimming beaches would be incidentally provided and not to encourage the activity. (Also see the response to comment No. 1 on Page I-35 for additional information.)

14. Comment:

Agriculture: Irrigation would allow more local ranches and farmers to run some type of cattle operation. Many local ranchers and farmers who irrigate now are having a hard time making a living. What makes you think more cattle operations will change that? What sense does it make to increase agricultural production in the Four Corners Area at the expense of such places as California's Imperial Valley? No sense at all. It is a simple case of the "pork barrel" in the Four Corners Area. Finally, will the new irrigation subscribers be able to pay for the cost of this project?

Response:

One of the problems confronting farmers and ranchers in the area is an inadequate water supply for irrigation. Water from the Dolores Project would help to alleviate this problem and bring more stability to farm

operations. Bureau of Reclamation studies indicate that with an assured full supply of water, a full-time farmer, on a recommended size farm, could pay all expenses, have an adequate living, and pay something towards amortization of project costs.

The Dolores Project would use water made available to the State of Colorado by the Colorado River Compact and Upper Colorado River Basin Compact. This water would not be available for use in California even if the Dolores Project were not built.

15. Comment:

Cost-Benefit Ratio: Although not addressed in the draft environmental impact statement, I don't believe the project has a high enough cost/benefit ratio to be worthwhile. I understand it is already less than 1 at current discount prices and by the time construction is finished the cost/benefit ratio will have dropped even further due to inflation.

Response:

The discount rate to be used in determining the benefit-cost ratio for the Dolores Project is specified by the Treasury Department, with concurrence of the Water Resources Council. On the basis of the specified rate, the benefit-cost ratio of the Dolores project is greater than unity.

Island Foundation

American Nat'l Bank Bldg., Suite 538
818 Seventeenth Street Denver, Colorado 80202
Telephone (303) 572-7628

December 17, 1976

Mr. David L. Crandall
Regional Director
Bureau of Reclamation
125 South State Street
Salt Lake City, Utah 84147

Re: Draft Environmental Impact Statement - Delores Project,
Colorado

Gentlemen:

The Island Foundation, a newly established private Colorado Foundation, is very concerned about activities in Colorado and elsewhere which effect wildlife, wilderness, natural resources and other aspects of the environment. The Foundation was established in the summer of 1976 for the general purposes of disbursing funds to environmental organizations and establishing and administering internal environmental programs. Specifically, the foundation grants funds to qualified environmental organizations for the purpose of preserving and conserving open space, natural scenic beauty wilderness, wildlife, outdoor recreation and other natural resources. It is the Foundation's intent to protect environmental quality and prevent environmental degradation.

The Foundation is particularly concerned about activities of the Bureau of Reclamation regarding projects impacting the eco-systems of the Delores River, however, we are also concerned about the impact of the entire Colorado River Storage Project. We agree fully with the contents of a letter written to you on December 12, 1976, by the Environmental Defense Fund (EDF), Trout Unlimited and the Wilderness Society, and fully support the basic premise of that letter, that a programmatic environmental impact statement is required for the entire Colorado River Storage Project. We intend to work in support of efforts to see that such an impact statement will be conducted.

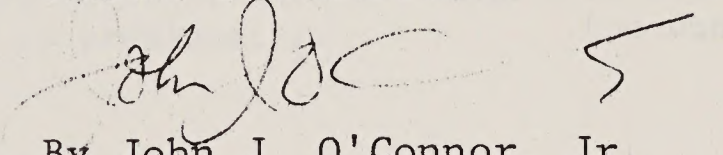
Regarding the Delores Project draft Environmental Impact Statement we feel that the statement is inadequate in that it did not consider the impact the project would have on the Delores River as a wild and scenic river and it did not consider problems of upstream and downstream flooding after the Delores project is complete. Both of these problems should be thoroughly investigated in that they are closely associated with the project. There are water allocation problems associated

the project such as determining the water rights of the Ute Indians and how these rights are to be affected. The unavoidable adverse effects as are set forth in the Draft EIS, concerning water resources, fish and wildlife, historical and archaeological sites are inappropriately weighed against the economic benefits and should therefore be given further consideration.

It is our general recommendation that the Delores Project as it is now planned should be discontinued. Other means of solving the areas problems should be sought at less cost and less environmental impact. If the project is not discontinued, it should at least be delayed until further studies can be conducted on secondary impacts, and until a programmatic environmental impact statement can be completed on the entire Colorado River Storage Project.

Sincerely,

ISLAND FOUNDATION



By John J. O'Connor, Jr.
Attorney for the Foundation

JJO:jcs

March 7, 1977

Memorandum

To: Files

Subject: Response to Island Foundation Letter of December 17, 1976, on
Dolores Project Draft Environmental Statement

1. Comment:

The Foundation is particularly concerned about activities of the Bureau of Reclamation regarding projects impacting the eco-systems of the Delores River, however, we are also concerned about the impact of the entire Colorado River Storage Project. We agree fully with the contents of a letter written to you on December 12, 1976, by the Environmental Defense Fund (EDF), Trout Unlimited and the Wilderness Society, and fully support the basic premise of that letter, that a programmatic environmental impact statement is required for the entire Colorado River Storage Project. We intend to work in support of efforts to see that such an impact statement will be conducted.

Response:

See Section C-14.

2. Comment:

We feel that the statement is inadequate in that it did not consider the impact the project would have on the Delores River as a wild and scenic river and it did not consider problems of upstream and downstream flooding after the Dolores project is complete. Both of these problems should be thoroughly investigated in that they are closely associated with the project.

Response:

Sections A-2 and C-13.g. have been revised to point out that the project would benefit the wild and scenic qualities of the Dolores River by providing a live stream and basic recreation sites along the river. As discussed in the statement, the Dolores River Wild and Scenic River Study Report based its recommendation of the river as a wild and scenic river on the assumption that the Dolores Project would be built. The report also concluded that the project would enhance the river downstream from McPhee Dam.

The statement does not consider flooding upstream from McPhee Reservoir since the project would have no impact on such floods. McPhee Dam would be designed to pass the maximum probable flood without sustaining damage, as stated in Section A-6a(1). Downstream flooding is addressed in Section C-4, where it is pointed out that flood control provided by the reservoir

would reduce flood damages by about \$50,000 annually, as estimated by the Corps of Engineers. The Corps conducted a thorough study of flood problems for the Dolores Project Feasibility Report of 1963 and revised the value of the damages for current studies. The corp's report is available for inspection at the Bureau of Reclamation office in Salt Lake City, Utah, or Durango, Colo.

3. Comment:

There are water allocation problems associated with the project such as determining the water rights of the Ute Indians and how these rights are to be affected.

Response:

Section B-5b of the statement has been amended to include a section on Indian water rights. The Ute Mountain Utes have not filed for water rights on the Dolores River although it is conceivable that they could since the Southern Ute Indians, under the Winters Doctrine, are seeking additional water rights in the San Juan River drainage through litigation. The impacts of the Ute Mountain Utes' seeking water rights on the Dolores River under the Winters Doctrine have not been analyzed since at the present time the question is problematic.

4. Comment:

The unavoidable adverse effects as are set forth in the Draft EIS, concerning water resources, fish and wildlife, historical and archaeological sites are inappropriately weighed against the economic benefits and should therefore be given further consideration.

Response:

The Bureau has attempted to present a balanced discussion of the various beneficial and adverse impacts of the project. It has also attempted to avoid a direct comparison of economic benefits with other considerations such as fish and wildlife or historical and archaeological sites since it does not possess a common system of measurement for such diverse, and often unquantifiable, considerations. The degree of success achieved in balancing these elements will, of course, be at least partially a matter of individual opinion.

5. Comment:

It is our general recommendation that the Delores Project as it is now planned should be discontinued. Other means of solving the areas problems should be sought at less cost and less environmental impact. If the project is not discontinued, it should at least be delayed until further studies can be conducted on secondary impacts, and until a programmatic environmental impact statement can be completed on the entire Colorado River Storage Project.

Response:

See Section C-14.

NOTES ON THE EDUCATIONAL IMPACT
OF THE DOLORES PROJECT

R.W. Bill Brown
Executive Director, San Juan Board of Cooperative Services
Durango, Colorado
December 3, 1976

As a staff member of the Board of Cooperative Services, I have been working with the public schools of Southwest Colorado for five years, and have a total of some twelve years of experience in education involving planning, management, special education, curriculum development, evaluation, and other related areas of educational administration.

I have reviewed the environmental impact draft on the Dolores project and am particularly concerned about the way the educational impact of the project for the area has been presented. The one paragraph on education (p. C-28) does not begin to consider the economic consequences to education that will result. Unless those consequences are detailed in the study and communicated to the residents of the area, the final commitment to the project by the communities will not be based on comprehensive information.

The points raised below are far from a complete picture of the educational ramifications of the Dolores project. However, the implications are of such magnitude that sufficient grounds for a complete assessment of the affects of the project are definitely demonstrated.

The study indicates that "...about 46 new teachers as well as additional classrooms would be needed..." Conservatively estimating a \$10,000 cost per teacher of salaries and fringe benefits, initially we have a cost of some \$460,000 for new instructional staff.

Further, we can estimate minimally an addition of 40 new classrooms. Again conservatively estimated at \$30 per square foot, for 900 square foot classrooms, the cost would be at least \$1,080,000. And this presumes that land for additional classrooms is already in possession by the respective school districts involved.

In terms of transportation, it is not unrealistic to expect that most students will have to be bussed to school. Presuming that a new fleet of 60 passenger buses could be optimally used, 1400 students (46 teachers x 30 pupils per class) will require 23 buses at a cost in the neighborhood of \$17,000 each, or a total of \$400,000. That many buses of course, also requires drivers, maintenance men, parts, gas, oil, tires, etc. At a cost of approximately \$31 per day to operate a vehicle (based on actual figures from the Durango schools) an additional \$130,000 for operation of vehicles could be anticipated.

Additional support services could also be anticipated. On the basis of PL 94-142 incidence figures, 12% of any school population will be handicapped. Therefore, approximately 170 children coming in with the project will require special education services. State law require speech therapists,

school psychologists, social workers, special education teachers, and others to serve these populations. Minimally, we can expect this number of children to necessitate the services of at least one psychologist, two speech therapists, one social worker, probably an additional special education administrator, and five special education teachers. The total annual cost for these people would be at least \$96,000. Adding travel, telephone, supplies, materials, and other incidental services for low incidence handicaps, this figure probably climbs to at least \$150,000 annual costs for special education services alone. At 60% reimbursement from the state, this leaves a net cost to communities of \$40,000.

Forty new classrooms will naturally require increased operational costs covering maintenance, utilities, administrative costs, etc. At a bare basis minimum of \$100 per month per classroom, this figure will surely exceed \$40,000 per year.

And still these figures do not consider additional food services, supplies and materials, equipment, athletic programs, communications, administration evaluation, books and instructional materials, etc.

A conservative figure for providing educational programs for 1400 additional students (or 35% more than currently reside in the attendance area), the project area will undoubtedly run in excess of \$2,250,000. Because some of the costs are on a one-time basis (classrooms and buses) and others are on an annual basis, this figure is certainly low. Over a five-year period, it would not be unrealistic to anticipate a total cost of providing an education for student growth generated by the project to easily exceed \$5,000,000. Probably this figure is low by at least 15-20 percent.

Now, how will this kind of cost be absorbed? The current authorized revenue base in the area is in the neighborhood of \$1,200 per student. Increased funds to districts per year through local taxation and state equalization will generate an additional \$1,580,000 per year. 50% of that figure is offset by state equalization reimbursement. The other 50% must be generated through local taxes each year. This figure is approximately \$840,000, or over \$4,000,000 over a period of five years.

How much of that figure will be absorbed by the workers moving into the area is anybody's guess. However, in all probability, the majority of families connected with the dam will almost certainly live in rentals or mobile homes. The property tax laws are currently being revised on mobile homes, so it is impossible to estimate the proportion of the added tax bill will be actually covered by the new residents. But I do not think it is unrealistic to anticipate that the greatest part of the additional property taxes will be paid by existing residents of the communities and not by the new residents. This has certainly been the case in other communities where reclamation projects have been initiated.

Incidentally, if a large proportion of families happen to move into the area after the annual ADM count made in October, there would be no state aid whatsoever for that one year, further necessitating substantial tax increases for the communities involved.

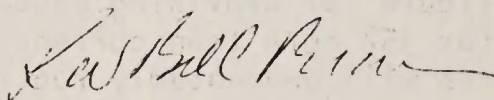
Historically, BUREC projects do not provide additional flow through funding to assist communities in coping with the impact of projects of this nature.

Another consideration involves the amount of taxable land that will be taken off the rolls when condemned by the project. This figure should be clearly established prior to final project approval.

In summary, the above notes are far from comprehensive, but do provide some modest concept of the tremendous educational implications of the proposed project. These implications are in no realistic way discussed in the current statement. Certainly local residents have at this point only a vague understanding of the impact the project will have upon their communities. I believe that it is incumbent upon the Departments of the Interior and of Reclamation to insure that the final impact statement includes detailed projections of all the actual costs involved for the communities involved in order that any final decision is made with people being aware of all of the facts.

I would further urge that a final education impact study be conducted involving school district administrators of the area and state department personnel, including Don Stenzel, Roy Brubacher, and C. L. Stiverson, who have all been involved in studies of this nature in the past.

Respectfully submitted,



R. W. Bill Brown
Executive Director
San Juan BOCS

March 7, 1977

Memorandum

To: Files

Subject: Response to San Juan Board of Cooperative Services Letter of December 3, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

I have reviewed the environmental impact draft on the Dolores project and am particularly concerned about the way the educational impact of the project for the area has been presented. The one paragraph on education (p. C-28) does not begin to consider the economic consequences to education that will result. Unless those consequences are detailed in the study and communicated to the residents of the area, the final commitment to the project by the communities will not be based on comprehensive information.

The points raised below are far from a complete picture of the educational ramifications of the Dolores project. However, the implications are of such magnitude that sufficient grounds for a complete assessment of the affects of the project are definitely demonstrated.

Response:

Section C-13.c.(2) of the statement has been expanded to contain a more detailed discussion of the expected impacts on education. The revisions are outlined in response to the questions below. The Bureau has informed the school districts in the area of the issues raised by Mr. Brown, and the estimates of project impacts are based in part upon their responses.

2. Comment:

The study indicates that "...about 46 new teachers as well as additional classrooms would be needed..." Conservatively estimating a \$10,000 cost per teacher of salaries and fringe benefits, initially we have a cost of some \$460,000 for new instructional staff.

Response:

The revised discussion does not contain the earlier estimate that 46 additional teachers as well as some additional classrooms would be required to accommodate new students attributable to project construction. As pointed out, the number of new students would begin at about 29 in the first year, increase to about 1,288 in the fifth year, and then decrease to 346 in the ninth and final year.

Presently, about 203 teachers are employed by the two districts (1972 estimates). The existing student-teacher ratio is about 22 to 1, and

the expected influx of 1,288 students during the peak year would only raise the student-teacher ratio to 28 to 1, given a reasonable grade distribution among the incoming students. This ratio is lower than that used by Mr. Brown and indicates that the need for additional teachers and structures could be minimal. The districts of course would have to decide how they wanted to handle the influx, but in as much as the peak influx would be of very short duration, it is doubtful if they would elect to undertake any substantial expansion program.

3. Comment:

Further, we can estimate minimally an addition of 40 new classrooms. Again conservatively estimated at \$30 per square foot, for 900 square foot classrooms, the cost would be at least \$1,080,000. And this presumes that land for additional classrooms is already in possession by the respective school districts involved.

Response:

The need for new classrooms as a result of project construction could vary considerably, depending upon the age distribution of the added students, the sizes of the existing rooms, the distribution of existing teachers, the number of students per class, and other considerations. As stated above, the two districts could accommodate all of the new students by increasing the number of students to 28 per class. Certainly, a significant part of the influx could be absorbed in this manner. Although some new rooms could be needed, it is reasonable to assume that the districts would avoid unnecessary additions, particularly since the estimated project effect would be temporary. The estimate of 40 new rooms in the comment above appears to be quite high rather than a minimum and is based on an assumption that only about 90 new students could use existing facilities.

4. Comment:

In terms of transportation, it is not unrealistic to expect that most students will have to be bussed to school. Presuming that a new fleet of 60 passenger buses could be optimally used, 1400 students (46 teachers x 30 pupils per class) will require 23 buses at a cost in the neighborhood of \$17,000 each, or a total of \$400,000. That many buses of course, also requires drivers, maintenance men, parts, gas, oil, tires, etc. At a cost of approximately \$31 per day to operate a vehicle (based on actual figures from the Durango schools) an additional \$131,000 for operation of vehicles could be anticipated.

Response:

Additional buses, if needed, could cause some financial problems, but the suggestion that essentially all of the new students would be bussed does not appear to be substantiated. In fact, since the State of Colorado has committed itself to the philosophy of restricted development in undeveloped rural areas, most of the project work force would have to locate in the municipalities where bussing is not the common practice.

Moreover, it is reasonable to assume, as indicated above, that the acquisition of new equipment would be kept to a minimum in response to an impact of short duration.

5. Comment:

Additional support services could also be anticipated. On the basis of PL 94-142 incidence figures, 12% of any school population will be handicapped. Therefore, approximately 170 children coming in with the project will require special education services. State law require speech therapists, school psychologists, social workers, special education teachers, and others to serve these populations. Minimally, we can expect this number of children to necessitate the services of at least one psychologist, two speech therapists, one social worker, probably an additional special education administrator, and five special education teachers. The total annual cost for these people would be at least \$96,000. Adding travel, telephone, supplies, materials, and other incidental services for low incidence handicaps, this figure probably climbs to at least \$150,000 annual costs for special education services alone. At 60% reimbursement from the state, this leaves a net cost to communities of \$40,000.

Response:

Reclamation is not aware of information on whether the project area is or is not accurately described by the generalization that 12 percent of the students in a given area are handicapped, and it does not seem logical to conclude that the same estimate would be valid for an influx of workers on short-term employment. It would be more reasonable to assume that families with school-aged children requiring special services now live where those services are available and would not be inclined to make a short-term move, particularly if the necessary services in the project area are only adequate for the present population. The workers likely to bring school-aged children to the area are those who can do so without creating significant problems for their children.

6. Comment:

Forty new classrooms will naturally require increased operational costs covering maintenance, utilities, administrative costs, etc. At a bare basis minimum of \$100 per month per classroom, this figure will surely exceed \$40,000 per year.

Response:

As pointed out previously, Reclamation considers the estimate of 40 new classrooms to be significantly higher than would actually occur from project construction.

7. Comment:

And still these figures do not consider additional food services, supplies and materials, equipment, athletic programs, communications, administration evaluation, books and instructional materials, etc.

Response:

The Bureau recognizes that the various services, equipment, and administrative requirements in the school districts would be increased by the project.

8. Comment:

A conservative figure for providing educational programs for 1400 additional students (or 35% more than currently reside in the attendance area), the project area will undoubtedly run in excess of \$2,250,000. Because some of the costs are on a one-time basis (classrooms and buses) and others are on an annual basis, this figure is certainly low. Over a five-year period, it would not be unrealistic to anticipate a total cost of providing an education for student growth generated by the project to easily exceed \$5,000,000. Probably this figure is low by at least 15-20 percent.

Response:

The Bureau of Reclamation recognizes that educational costs in the area would be increased but does not believe for the reasons stated in responses to 2, 3, 4, and 5 that the costs should be based upon providing new rooms, buses, programs, and other facilities for every student brought into the area. The districts would probably use existing facilities to accommodate as many of the new students as possible.

9. Comment:

Now, how will this kind of cost be absorbed? The current authorized revenue base in the area is in the neighborhood of \$1,200 per student. Increased funds to districts per year through local taxation and state equalization will generate an additional \$1,580,000 per year. 50% of that figure is offset by state equalization reimbursement. The other 50% must be generated through local taxes each year. This figure is approximately \$840,000, or over \$4,000,000 over a period of five years.

Response:

The costs of education would be paid from local taxes, State funds, and Federal impact aid funds available under Public Law 874 to alleviate the effects of Federal projects. As stated in Section C-13.c.(2), Montezuma-Cortez School District Re-1 estimates that its authorized revenue base is \$1,043.02 per student, about \$657 of which is paid by the State. The district also estimates that Federal funds of \$300 per student would be available. Both this district and Dolores School District Re 4A have indicated that temporary financial problems caused by project construction would be corrected by the Federal aid.

10. Comment:

How much of that figure will be absorbed by the workers moving into the area is anybody's guess. However, in all probability, the majority of

families connected with the dam will almost certainly live in rentals or mobile homes. The property tax laws are currently being revised on mobile homes, so it is impossible to estimate the proportion of the added tax bill will be actually covered by the new residents. But I do not think it is unrealistic to anticipate that the greatest part of the additional property taxes will be paid by existing residents of the communities and not by the new residents. This has certainly been the case in other communities where reclamation projects have been initiated.

Response:

Most of the construction force would live in mobile homes and rented apartments or homes and would consequently not pay property taxes. Part of these taxes may be indirectly passed on, however, in the form of rental fees. Although such temporary residents do not perhaps pay the additional property taxes, they also do not have the same percentage of students as the permanent residents since they do not always bring their families with them.

11. Comment:

Incidentally, if a large proportion of families happen to move into the area after the annual ADM count made in October, there would be no state aid whatsoever for that one year, further necessitating substantial tax increases for the communities involved.

Response:

The Bureau and the district recognize that the timing of the enrollment increase is important for both State and Federal funds. However, most construction workers would come into the area in the spring in anticipation of the heaviest construction season. Few would move in during the winter when construction activity is at its slackest.

12. Comment:

Historically, BUREC projects do not provide additional flow through funding to assist communities in coping with the impact of projects of this nature.

Response:

As stated previously, Federal funds of about \$300 per student would be available to assist the school districts in meeting the additional costs of education.

13. Comment:

Another consideration involves the amount of taxable land that will be taken off the rolls when condemned by the project. This figure should be clearly established prior to final project approval.

Response:

The land acquired for the project would be removed from tax rolls and would cause a loss of about \$7,000 annually in revenues, as discussed in Section C-13.h.

14. Comment:

In summary, the above notes are far from comprehensive, but do provide some modest concept of the tremendous educational implications of the proposed project. These implications are in no realistic way discussed in the current statement. Certainly local residents have at this point only a vague understanding of the impact the project will have upon their communities. I believe that it is incumbent upon the Departments of the Interior and of Reclamation to insure that the final impact statement includes detailed projections of all the actual costs involved for the communities involved in order that any final decision is made with people being aware of all of the facts.

Response:

The actual costs of the educational impacts cannot be evaluated without a detailed knowledge of the methods in which the districts would handle the increased students. As indicated in the responses to previous questions, these methods and the resulting costs would be flexible. The districts have been informed of the estimated project impacts and the concerns stated in these comments.

15. Comment:

I would further urge that a final education impact study be conducted involving school district administrators of the area and state department personnel, including Don Stenzel, Roy Brubacher, and C. L. Stiverson, who have all been involved in studies of this nature in the past.

Response:

The school districts are aware of the services available for consultation concerning the project impacts on education.

December 10, 1976

Regional Director
United States Department of the Interior
Bureau of Reclamation
Upper Colorado Regional Office
P.O. Box 11568
Salt Lake City, Utah 84147

Dear Sir:

The members of the San Juan Ecological Society appreciate the opportunity that you have given us to comment on the Draft Environmental Statement on the Dolores Project.

The proposed wildlife mitigation area on the west side of the McPhee Reservoir site is a topic of concern to our group. We feel that this area should be designed and protected as carefully as possible so that it will accomplish its intended purpose which is to replace habitat that will be inundated. First of all, the access road from the Great Cut Dike to the McPhee Dam should not be paved. A paved road here would encourage high speed motor traffic along the western border of the mitigation area. Such traffic would surely result in heavy road kills of deer and elk. Road kills are a major cause of mortality among big game animals in Colorado. We feel that this road should be graveled in order to control vehicle speed.

Also we feel that no borrow pits or rip rap areas should be established within the wildlife mitigation area. To extract such materials from the mitigation area would also defeat the purpose of the area.

The timing of construction of the reservoir and the wildlife mitigation area is critical. The purchase and enhancement of the mitigation area must be given high priority. The development of the wildlife area should be completed before reservoir filling is started so that losses of wildlife do not occur.

We feel that the subject of winter losses of big game due to their walking out on the frozen reservoir and falling through thin ice are inadequately dealt with in the Draft Environmental Statement. These losses are described as "temporary" and their importance is generally played down. We feel that the significance of these deaths must be recognized. Also, measures should be planned to prevent such deaths since the proposed reservoir blocks important mitigation routes and covers much winter range.

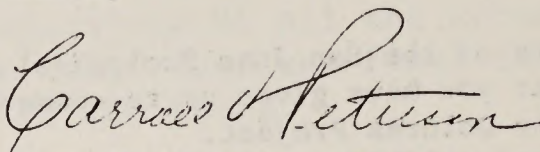
Also there should be no major recreation facility planned for the McPhee Dam site area. This area is an important big game migration route. The blocking of such routes by the reservoir may be

unavoidable, but additional routes should not be blocked by recreation sites.

The wording of the "Summary of Impacts" on page C-10 is very misleading as is Figure C-2 on page C-11. These statements and figure do not include the effect of depletion by the Dolores Project on the Colorado River.

Thank you for your consideration of these points.

Yours,



Carroll V. Peterson
President

March 7, 1977

Memorandum

To: Files

Subject: Response to San Juan Ecological Society, Inc., Letter of December 10, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

First of all, the access road from the Great Cut Dike to the McPhee Dam should not be paved. A paved road here would encourage high speed motor traffic along the western border of the mitigation area. Such traffic would surely result in heavy road kills of deer and elk. Road kills are a major cause of mortality among big game animals in Colorado. We feel that this road should be graveled in order to control vehicle speed.

Response:

Changing from a paved road to a gravel road would probably reduce vehicle speeds, but it would also reduce the braking efficiency of vehicles. The Forest Service, the Colorado Division of Wildlife, and the Bureau of Reclamation are formulating a management plan that would include efforts to reduce excessive mortality rates of big game animals on the road.

2. Comment:

Also we feel that no borrow pits or riprap areas should be established within the wildlife mitigation area. To extract such materials from the mitigation area would also defeat the purpose of the area.

Response:

Section A-6h and D-2.c. of the statement have been revised to discuss the possibility of obtaining materials from the mitigation area before it was developed. Borrow and riprap sites within the area would be used as little as possible. The topsoil in such areas would be stored and replaced after work was completed, and the sites would be reseeded. No significant long-term effect is anticipated.

3. Comment:

The timing of construction of the reservoir and the wildlife mitigation area is critical. The purchase and enhancement of the mitigation area must be given high priority. The development of the wildlife area should be completed before reservoir filling is started so that losses of wildlife do not occur.

Response:

The development of the wildlife mitigation areas is scheduled for completion 2 years before the completion of McPhee Dam. This information has been added to the discussion in Section A-6.f.(2).

4. Comment:

We feel that the subject of winter losses of big game due to their walking out on the frozen reservoir and falling through thin ice are inadequately dealt with in the Draft Environmental Statement. These losses are described as "temporary" and their importance is generally played down. We feel that the significance of those deaths must be recognized. Also, measures should be planned to prevent such deaths since the proposed reservoir blocks important mitigation routes and covers much winter range.

Response:

The environmental statement has been revised in light of studies at Blue Mesa Reservoir near Gunnison, which show that big game losses from ice are a long-range problem. Since the Colorado Division of Wildlife has no economic method for preventing such losses, they are now classified as an unmitigated and unavoidable adverse effect for the Dolores Project.

5. Comment:

Also there should be no major recreation facility planned for the McPhee Dam site area. This area is an important big game migration route. The blocking of such routes by the reservoir may be unavoidable, but additional routes should not be blocked by recreation sites.

Response:

With the exception of the Hoppe Point Recreation area which would be developed immediately downstream from the reservoir, the recreation areas are adjacent to the reservoir which would itself block the migration routes. The recreation area at Hoppe Point would be used primarily during the summer. Since the deer and elk would use the migration route during the winter, no significant impact is expected from human activity.

6. Comment:

The wording of the "Summary of Impacts" on page C-10 is very misleading as is Figure C-2 on page C-11. These statements and figure do not include the effect of depletion by the Dolores Project on the Colorado River.

Response:

The material referred to has been revised to include the effect of project depletions on the quality of water in the Lower Colorado River.

Route 2, Spruce Canyon Circle
Golden, CO 80401
December 12, 1976

Office of the Regional Director
Bureau of Reclamation
Federal Building
125 South State Street
Salt Lake City, UT 84147

Dear Sir;

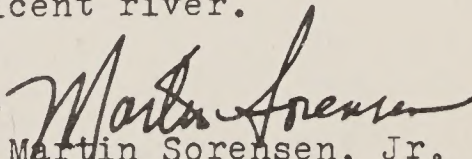
The following is to be included in the official hearing record for INT DES 76-44, Dolores Project, Colorado.

"The Rocky Mountain Chapter of the Sierra Club, at this point in time, stands in opposition of this project.

The Upper Colorado River Basin is one of the most important watersheds in the United States. It services a fast-growing region where climatic conditions are, in large part, arid or semi-arid. The watershed provides life support to organisms (including man) which find the struggle for existence an uphill struggle. These organisms are, as a result, totally interdependent for the success of living. The tributaries of the Upper Colorado River weave together a critical system for support of life in the region.

The Dolores Project is but one of many projects designed to make better use of the water resources of the Upper Colorado. At least, this what the citizen is lead to believe. We feel there is sufficient need to analyze the Dolores Project with other impoundment proposals of the Public Law 90-537 of September 30, 1968 (Colorado River Basin Act). The acceptance of one dam after another is no longer automatic. The quality of the Upper Colorado River requires much greater analytical endeavors. Either we attempt to better understand our cumulative effects or we may wreck a magnificent river.

Sincerely,


H. Martin Sorensen, Jr.
Chmn: Water Resources Comm.
Rocky Mtn. Chapt. Sierra Club
Civil Engineer

January 21, 1977

Memorandum

To: Files

Subject: Response to Sierra Club Letter of December 12, 1976, on
Dolores Project Draft Environmental Statement

1. Comment:

The Dolores Project is but one of many projects designed to make better use of the water resources of the Upper Colorado. At least, this is what the citizen is lead to believe. We feel there is sufficient need to analyze the Dolores Project with other impoundment proposals of the Public Law 90-537 of September 30, 1968 (Colorado River Basin Act). The acceptance of one dam after another is no longer automatic. The quality of the Upper Colorado River requires much greater analytical endeavors. Either we attempt to better understand our cumulative effects or we may wreck a magnificent river.

Response:

See Section C-14.



UPPER COLORADO RIVER COMMISSION

355 South Fourth East Street

Salt Lake City, Utah 84111

December 7, 1976

Mr. David Crandall
Regional Director, Bureau of Reclamation
Box 11568
Salt Lake City, Utah 84147

Dear Dave:

We have reviewed the Draft Environmental Statement on the Dolores Project which was enclosed with your letter of November 2, 1976.

This draft statement is well written and appears to fulfill the requirements of P.L. 91-190. We have the following minor comments to offer:

(1) The statement on page A-2 that "Congress has authorized the construction of four units including Paradox Valley" is of course true, however, we suggest a qualifying statement to the effect that because of the high cost per ton of salt removed, the Crystal Gysler Unit is not being recommended for construction.

(2) Table C-3 on page C-9 could probably be identified as applying only to September to avoid it being confused as an annual table.

(3) Page D-4 next to last line should be "Colorado" Basin rather than "Upper" Basin.

Sincerely yours,

Ival V. Goslin
Executive Director

IVG:jho

January 21, 1977

Memorandum

To: Files

Subject: Response to the Upper Colorado River Commission, December 7, 1976,
Letter on the Dolores Project Draft Environmental Statement

1. Comment:

(1) The statement on page A-2 that "Congress has authorized the construction of four units including Paradox Valley" is of course true, however, we suggest a qualifying statement to the effect that because of the high cost per ton of salt removed, the Crystal Geyser Unit is not being recommended for construction.

Response:

The Bureau of Reclamation is not seeking construction funding for the Crystal Geyser Project because it does not appear warranted by the cost effectiveness under present plans; however, no formal recommendation has been made that the project not be constructed.

2. Comment:

(2) Table C-3 on page C-9 could probably be identified as applying only to September to avoid it being confused as an annual table.

Response:

The title of the table has been modified as suggested.

3. Comment:

(3) Page D-4 next to last line should be "Colorado" Basin rather than "Upper" Basin.

Response:

The suggested revision has been made.

d. Comments from Individuals

Jim O'Brien

Robert Merritt

Albert W. Spencer

Steven Cone

*Grace Welsch

*James L. Welsch

*These letters express general agreement with the project plan. No issue is raised for which a response is considered necessary. The review of the Draft Environmental Statement, however, is appreciated.

David L. Crandall
Regional Director
Bureau of Reclamation
Upper Colorado Regional Office
P. O. Box 11568
Salt Lake City, Utah 84147

RE: Response to the Draft Environmental Impact Statement for
the Authorized Dolores Project, Colorado.

Gentlemen:

The opportunity to respond to the Draft Environmental Impact Statement on the Dolores Project is greatly appreciated. It is my expressed hope that the questions presented and the subjects addressed to in this response will encourage and stimulate examination of the project.

The major topic of concern is the economics of the project as related to both the national and regional economic accounting stances. Some of the following comments are addressed to the benefit-cost analysis of the financial and economic evaluation. Even though legislation permits project economic evaluation at a discount rate of 3 1/4 percent, is it possible for the Bureau of Reclamation to show the economic analysis calculated at the true dollar value? If not, why? The Water Resources Council has established the discount rate for Bureau projects at 6 1/8 percent. The procedure for calculating the discount rate is to compute the nominal rate of interest on federal securities having fifteen or more years left to maturity. The nominal or coupon interest rate is that rate printed on the bond. A more realistic discount rate would be computed by using the effective rate of interest the annual interest per bond divided by the current market price of the bond. Though both methods under estimate the pretax rates of return on business investments, and the time preference rates of the consumer public, the effective rate of interest is a better approximation of annually increasing discount rate. The discount rate based on the effective rate of interest should be 7 1/2 - 8 percent.

Calculation of the Dolores Project Benefit-Cost ratio utilizing the Water Resource Council's discount rate of 6 1/8 percent allows the following comparison:

Benefit-Cost Ratio at	3 1/4%	6 1/8%
Direct	.95:1	.57:1
Total	1.19:1	.72:1

These figures are based on the Bureau's figures for project with Towaoc irrigation development.

Previous project descriptions (February 1975) predicted a depletion of 91,000 acre-feet from the Colorado River. The DEIS

projects only a net depletion of only 80,900 acre-feet. Why is this estimate lower? If 80,900 acre-feet of water is denied to downstream Colorado River water users, then those financial losses should be accountable to the cost of the project. Does this figure in Table 11 of the benefit-cost analysis? If it doesn't, why not? A conservative estimate of \$15 per acre-foot may be the cost incurred to downstream water users, a cost to the project of \$1,212,000 annually.

The Bureau, on page C-10 of the DEIS, projects economic damages of \$230,000 annually for the increase of salinity of 1 mg/l at Imperial Dam. Does this cost appear in the benefit-cost analysis? The cost attributed to the Dolores Project annually from these two noteworthy aspects, stream depletion and increased salinity is \$1,442,000 annually. If included into the benefit-cost ratio computed with a discount rate of 6 1/8 percent, the benefit-cost ratio becomes:

Direct	.52:1
Total	.64:1

Comparing the benefit-cost analysis figures with those obtained from the Bureau in May of 1975, how is it possible for the cost of the project to increase from \$142 million to \$186 million and interest during construction decrease from \$12.1 million to \$10.1 million?

Municipal and industrial water demands are based on an increase in per capita water use to 325 gallons per day and projected population growth rates. The DEIS should contain population projections for Cortez, Dove Creek, and Towaoc over the life of the project and municipal and industrial water requirements for these projections. A comparison with previous projections for 1970 and 1975 with actual population figures would help to demonstrate the Bureau's ability in estimating benefits accrued from municipal-industrial water.

Much publicity has high-lighted the depressed nature of the economy in the Four Corners Region of Colorado, the emphasis centered on high rates of unemployment. The DEIS on page B-4 focuses on this issue citing unemployment figures of 5.9 percent unemployment in Dolores and Montezuma Counties, with the Indian labor force accounting for 50 percent of the total unemployment. Fourteen point two percent of the families in the area had income below the poverty level. Area redevelopment is defined as that portion of the construction costs and operation, maintenance, and replacement that can be applied to the employment of unskilled labor in the area. Indians are categorized as unskilled labor. The benefit-cost analysis shows \$580,000 per year will be accrued as benefit to the area by direct hiring of unskilled labor. The DEIS, page C-29, states that, "Although most of the unskilled labor would come from the local area, about 85 percent of the skilled labor would come from

outside the area." I feel justification of this statement seems warranted based on the importance placed on the project ameliorating the economic problems and upgrading the overall standard of living of the depressed area. Construction of the project would provide 6,270 jobs in direct employment, page C-29, DEIS. How many of these jobs are for skilled labor? For unskilled labor? How much money would be spent annually on each? How much labor would be imported to the area in each category? Why does the maximum of 1,300 jobs in direct employment on page C-29 contradict with the figure of 700 jobs during peak periods on page A-41? How many jobs would employ Indians? What project benefits would be accrued from this employment?

The realization of added income by the local community depends on the importation of labor and the distribution of funds to the appropriate income level. Water projects are not efficient methods for achieving redistribution of income and each project will yield a particular pattern for incidence of benefits. The success of distributing project investment funds to the non-skilled laborer through his employment to achieve both regional and national benefit will depend on whether he was previously unemployed, whether he was imported from outside the region, the companies which employ him for project construction, the social sub-group to which he may belong, and the relative portion of the population he may represent in decreasing unemployment. This important aspect of the project, and its relevance to the reasons underlying construction funding needs to be expounded upon. The DEIS does not seem to adequately address this topic. Further questions are: From what areas will contracted construction firms be considered? Grand Junction? Denver? Outside the state? How much of the labor force will they be allowed to import? Are there any local construction firms that can be considered for project construction?

Irrigation farming is the next subject of discussion. Understandably, one of the objectives of project irrigation water supply is the improvement of the production of feed crop yields and expansion of livestock operation. Page A-3, DEIS, states that project irrigation supplies are expected to be used mainly for production of feed crops in support of general beef and dairy enterprises. The increasing importance of livestock production is reiterated on pages B-48 and C-30. What effect will the project have on livestock feed prices? A decrease in feed prices may result in lower market prices for beef. The inelastic prices of agriculture generally influences the output of large projects to have the effect of lowering market prices. What effect will lower beef prices have on farm incomes based on expanded operations? Will there be any displacement of farmers unable to compete with lower prices? Particularly, those outside the project area? These are important issues, I think, that can be confronted in the DEIS and possibly substantiated with statistical information.

The communities' facilities and services may become inadequate due to demands imposed by the project accelerating growth trends. Education, housing, police and fire protection, water and sewage facilities, and health services may experience strains on the existing level of services and facilities as indicated on pages C-27 through C-29. Does the economic analysis of the project disclose the costs of expanded services and facilities attributable as a function of the project?

White-water rafting is mentioned seven times in the DEIS. Two of those instances are alluded to as alternative plans to the proposed project. The prediction that opportunities for white-water boating in the Dolores River will be increased as a result of project is presented in the remaining comments of the DEIS. On page A-34 of the DEIS, the statement occurs that estimated boating days would increase by 1,320 days to an average of 2,580 days by project allocation of water releases. On page B-50, only 20 to 25 percent of the boating opportunities are used. I don't think that this information is correctly represented and there is no statistical data to confirm the Bureau's conclusions. The answers to the following questions would help to shed some light on the problem.

1. What methods were employed to analyze the white-water boating data?
2. What sources were consulted and utilized?
3. Were commercial river outfitters contacted to contribute to the data gathering process?
4. What historical flow data was evaluated?
5. What was the gross revenue of commercial rivering operations acquired both directly by outfitters and received indirectly by the community through services and businesses?

Enjoyable rafting experiences on the Dolores River can occur above 4,500 second feet and below 1,000 second feet. I have rafted the Dolores in both cases. Flows between these two figures should account for more white-water boating user days than the Bureau predicts.

6. How many user days does the Bureau predict under project conditions and how many boating days occur between 1,000 and 4,500 cfs without the project?

I believe that there will be a net decrease in the number of white-water boating user days under project conditions and that the loss in revenues incurred by commercial outfitters under project operation should be attributed to the cost of the project.

Final questions regarding white-water boating and project development: Are the four recreational facilities serving white-water boating downstream of the dam being developed as a cost assigned to the project? If the project is not constructed would the recreational development be constructed as a function

of the potential Wild and Scenic River management? The aspect of white-water boating is addressed only as a footnote in section C, Environmental Impacts. I think that this is an inadequate discussion of the subject.

Hunting and fishing are two more aspects of the project's recreational development that generate further questions. The estimate of 28,000 fisherman-days on page C-12 appears difficult to justify, particularly when only 10,000 fisherman-days would occur in the first 11 miles of river below the dam. Eighteen thousand fisherman-days in the river stretch from Bradfield Ranch to Slick Rock seems dubious because virtual absence of access, poor water quality resulting from tributaries, and warm water temperatures. Since the project will enhance the fishery, substantiation of 28,000 predicted fisherman-days is warranted. Temperature of the river water and dissolved oxygen levels dictate the viability of a trout fishery, predicted temperature and DO level curves versus river miles would help explain these questions.

How far does the trout fishery expect to extend down river from the project?

How many fisherman-days are predicted for each access point?

What historical information would give insight to the prediction of 28,000 fisherman-days?

How was the figure of 28,000 arrived at?

Elaborate figures for hunting use are estimated for deer, elk, waterfowl, small game, bear, etc., both for historical activity (B-50) and for future increases (C-21). The numbers are projected within the range of \pm 10 man-days.

Why is not the loss of hunting man-days with population reductions due to project impacts, inundation of migration routes, relocation of herds to over populated areas, and reduction of winter range evaluated and a cost per man-day assessed to the project?

The project impacts on wildlife deserves further debate. In my opinion, the substantial relocation of elk and mule deer, mountain lion and black bear is evitable with recreational activity around reservoir, snowmobile use in the winter, traffic on the paved river road downstream of the reservoir. This is an important environmental impact, the result being the disruption of a fragile ecological balance of wildlife. What approximate numbers has the Bureau estimated for relocation? What losses will be incurred due to relocation to presently overpopulated areas. On page A-36 of the DEIS, 4,150 acres of land are cited to be acquired and improved for elk and deer habitat.

This land is already serving as range area, particularly in the winter. The McPhee Reservoir alone will inundate 4,500 acres of winter range. This results in a net loss of range. What methods will be implemented to insure the mitigation lands managed as a wildlife area will have a carrying capacity to compensate for the loss?

The DEIS reports on page B-35, 36, that no threatened or endangered species of fish exist in the project area. What is the potential habitat in the downstream portion of the Dolores River for threatened or endangered species? Does any habitat presently exist? What effects will the project have on this habitat? How will colder temperatures of the river water as a result of the project effect the existing warm water species in the lower river? The Wild and Scenic River Study Report, page 29, describes the lower river stretches as historical habitat for humpback suckers, the bonytail chub, and the Colorado Squawfish. What is the cost of installation and maintenance of fish screens? What would fishes losses be estimated at?

The subject of disturbance of peregrine falcons is approached with a degree of tactfulness. What is the potential of the peregrine falcon's using the river valley through the reservoir site as a hunting area, which historically it has served as? What procedure will be followed if the peregrines nest within the reservoir site? What effect will increased recreation in the river valley with the project in place have on potential hunting habitat?

Construction of McPhee Reservoir obviously will change the water flow characteristics of the Dolores River downstream of the project. Several aspects concerning the water related resources of the project are pursued in the following discussion. Examination of the Discharge-Frequency Curves for flooding of the Dolores River constructed by the Army Corp of Engineers in 1966, reveals that the spillway and outlet works could handle a 100 year flood effectively. Nevertheless, where would the water overflow and what would the ramifications be if the spillway and outlet works cannot handle the flood discharge? What would be the effect on the river channel immediately downstream of the spillway?

The regulation of flows in the Dolores River below McPhee Reservoir will alter the depositional and scouring characteristics of the river as indicated on pages C-3, C-13 of the DEIS. How will the channel bed and its materials be progressively modified downstream? Will this result in the formation of new sandbars or removal of sandbars since the sediment carrying capacity of the channel varies as the seventh power of the velocity? Will the water carrying capacity of the channel change thus altering the flooding characteristic of the river? How will the loss of the natural flushing phenomenon of flows above 3,000-4,000 cfs change the river environment?

The groundwater table situation in the town of Dolores deserves some investigation. The groundwater table, particularly in the spring, is known to be very high. What will the groundwater table level below the town of Dolores be after the reservoir is filled? How much higher will this be than the existing water table? What seasonal fluctuations will occur? Will heaving and sweating of the expansive soils underlying the town cause any structural damage? This could possibly result in a severe problem years after the project was operating.

The existing sewage treatment plant at the town of Dolores also raises some cause for concern. Will the soils leach any nutrients or toxic materials into the reservoir from the removed waste treatment facilities? Page C-5 indicates the reduced possibility of occasional nutrient surge into the reservoir with removal of the Dolores waste treatment plant. What possibility still exists either from the soils underlying the present facilities or the new facilities. Project funds will reimburse the town of Dolores for the removal of the existing plant at its replacement value. What is the cost of a new facility? Who pays the difference between the replacement value of the old facility and the cost of the new facility? Is this a cost that theoretically is assessed to the project? The statement on page C-28 regarding project funds allocated to relocate the Dolores sewage facilities is misleading, giving the impression the project funds would pay for the new facility entirely. This statement may be reworded to more closely coincide with the statement on page A-12.

It is conceivable that with a flood of sizable magnitude, the mine and mill tailing ponds at Rico could be washed away. Assuming the reservoir is under operating conditions, the toxic wastes (though highly diluted) could settle out in the reservoir. What would the effects of the metals and toxic substances have on the water supply for municipal-industrial users, irrigation, etc.? What effect would this have on aquatic life? Suppose the toxic substances stratify in the reservoir, would this permit increased exposure to those fish and invertebrates which exhibit low levels of tolerances? The potential hazards and costs to the community, should such disaster occur, appears significant enough to warrant a thorough analysis of the situation.

The number of archaeological sites affected by the project is appalling. What cost is assessed to the project as a consequence of the deprivation of future examination and investigation by improved techniques and advanced knowledge of the various cultures? If the project was not proposed, would the project area (including the reservoir) qualify as an archaeological district in the National Register of Historic Places?

The remainder of this response will approach subjects of a general nature.

In light of the recent disaster of Teton Dam, what precautions are being implemented to safeguard against a similar occurrence? What grouting techniques will be employed? Is the geology of the area capable of initiating an analogous set of circumstances? Who will review the Bureau's design and plans of the dam?

Previously, I was informed that the Dolores Project and the Paradox Valley Project were completely independent projects. What is implied by the statement of page A-2 that indicates the projects are "interrelated"?

If an agreement with MVIC and the Dolores Conservancy District is unable to be negotiated for the availability of project water (page A-1, 2), what is the status of the project?

Will the river road between McPhee Dam and Bradfield Ranch be paved with project funds? What will be the environmental impacts, particularly on wildlife, i.e., elk and mule deer migration routes?

On page A-28, the Great Cut Pumping Plant, based on historical information, would have been required to operate only 15 of 46 years. Can it be construed that the pumping plant operation will be necessary only one out of every three years in the future?

Why can't the existing MVIC tunnel be utilized instead of constructing the new Dolores Tunnel?

The DEIS cites noise levels that will be maintained on page D-1. How will noise control be regulated? What are the repercussions if the limits are exceeded?

If the ability to contribute salt to the San Juan River would diminish with continuous operation, why wouldn't the ability to absorb salts in the Mancos area show similar decline?

The statement, "Water uses could be changed in the future, however." appears on page G-1 of the DEIS. Please explain the text and scope of this statement. Could the water be reallocated in the future, that is, from irrigation to municipal-industrial water, from recreation uses (white-water boating) to irrigation, or for an entirely new purpose? Could it be reallocated to a different project, for example, coal mining? What would happen to the cost effectiveness of the project in this instance? Would such redistribution of the water resources be based on decisions regarding economic and environmental feasibility?

Does the statement of page H-9, third sentence, first paragraph, imply that the existing plan for a possible designation of the Dolores River as a possible Wild and Scenic River would no longer be valid if the Dolores Project were not constructed?

What fate lies in store for the McPhee Reservoir and Dolores Project, when the life of the project is complete, the demands become greater than the project can meet, the reservoir silts up, or the project and reservoir outlive their usefulness?

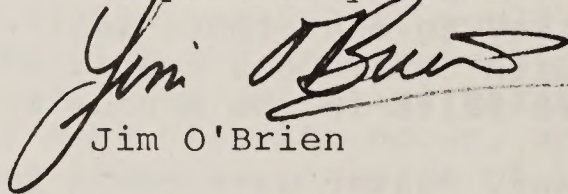
The economic and environment problem that confronts the evaluator of government projects such as the Dolores Project, is to determine the best use of available scarce resources to maximize project output for improving human welfare. Such a determination requires thorough examination of possible alternatives where real need is exhibited. A diversity of landscapes and natural features must be preserved to allow flexibility in future land use patterns and development. Development for the sake of development is no longer a viable land use alternative.

It is my opinion that the Dolores Project will result in net degradation of the environment and be an additional tax burden on the American people. The need for bigger and better dams has become obsolete as the dwindling number of free flowing rivers indicates.

I truly hope that it will not be necessary to continue to sacrifice small treasures of learning, beauty, and life systems to achieve political and economic advancement.

These few comments, I hope will help to gain a more clear understanding and broader outlook to the impacts of the project on the community and the nation. I also hope the questions are indicative of the peoples' desire to challenge the motivations of government.

Respectfully submitted,



Jim O'Brien

1085 11TH ST.
BOULDER, CO. 80302
442-3429

March 7, 1977

Memorandum

To: Files

Subject: Response to Jim O'Brien Letter on Dolores Project Draft Environmental Statement

1. Comment:

The major topic of concern is the economics of the project as related to both the national and regional economic accounting stances. Some of the following comments are addressed to the benefit-cost analysis of the financial and economic evaluation. Even though legislation permits project economic evaluation at a discount rate of 3 1/4 percent, is it possible for the Bureau of Reclamation to show the economic analysis calculated at the true dollar value? If not, why? The Water Resources Council has established the discount rate for Bureau projects at 6 1/8 percent. The procedure for calculating the discount rate is to compute the nominal rate of interest on federal securities having fifteen or more years left to maturity. The nominal or coupon interest rate is that rate printed on the bond. A more realistic discount rate would be computed by using the effective rate of interest the annual interest per bond divided by the current market price of the bond. Though both methods under estimate the pretax rates of return on business investments, and the time preference rates of the consumer public, the effective rate of interest is a better approximation of annually increasing discount rate. The discount rate based on the effective rate of interest should be 7 1/2-8 percent.

Response:

The Secretary of the Treasury has determined that the appropriate discount rate to be used in judging the economic feasibility of the Dolores Project is 3 1/4 percent. This rate was current at the time the project was authorized and its use also has the concurrence of the Water Resources Council. Consequently, the Bureau of Reclamation has not made an analysis of the Dolores Project's feasibility using a 6 1/8 percent discount rate since it has no authority to do so.

2. Comment:

Previous project descriptions (February 1975) predicted a depletion of 91,000 acre-feet from the Colorado River. The DEIS projects only a net depletion of only 80,900 acre-feet. Why is this estimate lower? If 80,900 acre-feet of water is denied to downstream Colorado River water users, then those financial losses should be accountable to the cost of the project. Does this figure in Table 11 of the benefit-cost analysis? If it doesn't why not? A conservative estimate of \$15 per acre-foot may be the cost incurred to downstream water users, a cost to the project of \$1,212,000 annually.

Response:

The figure of 91,000 acre-feet annually was a preliminary estimate used by Bureau personnel during advance planning studies. That estimate was refined recently, and the figure of 80,900 presents a more thorough and accurate analysis of the same plan that was used for the earlier estimate.

The project would not deny to downstream users any water legally allocated to them. The water used would be part of the water allocated to the Upper Colorado Basin by the Colorado River Compact of 1922 and allocated to Colorado by the Upper Colorado River Basin Compact of 1949.

In accordance with Department of the Interior policy, economic data is not included in the environmental impact statement but is available in Bureau of Reclamation offices in Salt Lake City, Utah, and Durango, Colo. The economic analysis does reflect the Dolores Project's share of the costs for the major regulatory reservoirs of the Colorado River Storage Project, which benefit all participating projects. This cost is estimated at \$2 for each acre-foot of stream depletion. The economic effects of salt contributions to the Colorado River as measured at Imperial Dam are also reflected in the economic analysis.

3. Comment:

The Bureau, on page C-10 of the DEIS, projects economic damages of \$230,000 annually for the increase of salinity of 1 mg/l at Imperial Dam. Does this cost appear in the benefit-cost analysis?

Response:

The benefit-cost analysis was computed for the Dolores Project under conditions without and with externalities. Salt loading amounting to an annual cost of \$230,000 was included in the analysis with externalities. Salt concentration costs totaling \$2,323,000 annually were not considered in the analysis since the State of Colorado and other basin States, by the Colorado River Basin Compact of 1922, have the right to divert and deplete their apportioned water in the Colorado River system without penalty. Also see response to comment number 1 above.

4. Comment:

Comparing the benefit-cost analysis figures with those obtained from the Bureau in May of 1975, how is it possible for the cost of the project to increase from \$142 million to \$186 million and interest during construction decrease from \$12.1 million to \$10.1 million?

Response:

The difference in the estimated interest during construction is the result of using different methods of computation. The figure of \$12.1 million was a preliminary estimate determined by a short-cut method that

did not consider all of the detailed facilities. The figure of \$10.1 million is a later, more accurate estimate determined by an accounting of each project facility.

5. Comment:

Municipal and industrial water demands are based on an increase in per capita water use to 325 gallons per day and projected population growth rates. The DEIS should contain population projections for Cortez, Dove Creek, and Towaoc over the life of the project and municipal and industrial water requirements for these projections. A comparison with previous projections for 1970 and 1975 with actual population figures would help to demonstrate the Bureau's ability in estimating benefits accrued from municipal-industrial water.

Response:

Information on population growth for the major communities has been added to Section C-13. These predictions have been made through the year 2030, which is approximately the time by which the users must repay the project costs for municipal and industrial water.

In the 1963 project feasibility report, the Bureau estimated the 1970 populations at 9,600 for Cortez and 1,400 for Dove Creek, both considerably lighter than actually occurred. The major factor in this difference was the oil and gas boom of the 1950's, which led to unusually rapid growth from 1950 to 1960 followed by a decline from 1960 to 1970. Because the Bureau's projections were made at about the peak of this boom, they reflected the accelerated rate of growth. Seen in retrospect, however, the boom was a short-lived phenomenon, and this fact is taken into account in the latest estimates of future population growth.

6. Comment:

Much publicity has high-lighted the depressed nature of the economy in the Four Corners Region of Colorado, the emphasis centered on high rates of unemployment. The DEIS on page B-4 focuses on this issue citing unemployment figures of 5.9 percent unemployment in Dolores and Montezuma Counties, with the Indian labor force accounting for 50 percent of the total unemployment. Fourteen point two percent of the families in the area had income below the poverty level. Area redevelopment is defined as that portion of the construction costs and operation, maintenance, and replacement that can be applied to the employment of unskilled labor in the area. Indians are categorized as unskilled labor. The benefit-cost analysis shows \$580,000 per year will be accrued as benefit to the area by direct hiring of unskilled labor. The DEIS, page C-29, states that, "Although most of the unskilled labor would come from the local area, about 85 percent of the skilled labor would come from outside the area." I feel justification of this statement seems warranted

based on the importance placed on the project ameliorating the economic problems and upgrading the overall standard of living of the depressed area. Construction of the project would provide 6,270 jobs in direct employment, page C-29, DEIS. How many of these jobs are for skilled labor? For unskilled labor? How much money would be spent annually on each? How much labor would be imported to the area in each category? Why does the maximum of 1,300 jobs in direct employment on page C-29 contradict with the figure of 700 jobs during peak periods on page A-41? How many jobs would employ Indians? What project benefits would be accrued from this employment?

Response:

Section C-13.d. states that the 9-year construction period would provide a total of 6,270 man-years in direct employment, with about 85 percent (5,330) filled by predominantly skilled labor from outside the area and 15 percent (940) filled by predominantly unskilled labor from within the area. This estimate is based upon the Bureau's experience with similar projects. Of the estimated \$178.2 million spent during construction, \$71.3 million would consist of local salaries for direct employment and would provide average annual benefits of \$580,000 for unskilled labor. In addition, indirect employment of about 4,390 man-years would be provided for skilled and unskilled workers in service industries, with 95 percent of these jobs filled by local people.

The number of Indians employed and the resulting benefits have not been estimated, since the Bureau would not control the hiring by private contractors. The contractors would be required, however, to follow Federal and State regulations for equal opportunity employment. Chances for unskilled employment are expected to be good. Chances for skilled employment would be fewer since construction experience and training would be required. The Indians would benefit considerably more from irrigation and municipal and industrial water than from short-term construction work.

The job figure in Chapter A was incorrectly reported and has been corrected to agree with the figures given in Chapter C.

7. Comment:

The realization of added income by the local community depends on the importation of labor and the distribution of funds to the appropriate income level. Water projects are not efficient methods for achieving redistribution of income and each project will yield a particular pattern for incidence of benefits. The success of distributing project investment funds to the nonskilled laborer through his employment to achieve both regional and national benefit will depend on whether he was previously unemployed, whether he was imported from outside the region, the companies which employ him for project construction, the social subgroup to which he may belong, and the relative portion of the population he may represent in decreasing unemployment. This important aspect of

the project, and its relevance to the reasons underlying construction funding needs to be expounded upon. The DEIS does not seem to adequately address this topic. Further questions are: From what areas will contracted construction firms be considered? Grand Junction? Denver? Outside the state? How much of the labor force will they be allowed to import? Are there any local construction firms that can be considered for project construction?

Response:

The Bureau of Reclamation does not have within its jurisdiction the right to regulate the importation of construction-related labor or service-related labor from outside the project area. Statistics from past Bureau projects similar to the Dolores Project have shown 85 percent of the construction labor and 5 percent of service-related labor was imported from outside the project area. Similarly, the Bureau does not restrict construction firms from outside the local area or State from competing for project contracts. The contractor submitting the lowest reasonable bid is selected.

8. Comment:

Irrigation farming is the next subject of discussion. Understandably, one of the objectives of project irrigation water supply is the improvement of the production of feed crop yields and expansion of livestock operation. Page A-3, DEIS, states that project irrigation supplies are expected to be used mainly for production of feed crops in support of general beef and dairy enterprises. The increasing importance of livestock production is reiterated on pages B-48 and C-30. What effect will the project have on livestock feed prices? A decrease in feed prices may result in lower market prices for beef. The inelastic prices of agriculture generally influences the output of large projects to have the effect of lowering market prices. What effect will lower beef prices have on farm incomes based on expanded operations? Will there be any displacement of farmers unable to compete with lower prices? Particularly, those outside the project area? These are important issues, I think, that can be confronted in the DEIS and possibly substantiated with statistical information.

Response:

Livestock prices are determined at the central markets, such as Greeley, Kansas City, etc. Local prices will differ from the central market prices by only the shipping costs from the local area to the central market. The magnitude of livestock production in the Dolores area is not sufficient to affect the central market prices, regardless of any increase in the amount of feed crops produced or decrease in livestock production costs.

9. Comment:

The communities' facilities and services may become inadequate due to demands imposed by the project accelerating growth trends. Education, housing, police and fire protection, water and sewage facilities, and health services may experience strains on the existing level of services and facilities as indicated on pages C-27 through C-29. Does the economic analysis of the project disclose the costs of expanded services and facilities attributable as a function of the project?

Response:

Costs of additional community facilities and service have not been estimated or included in the economic analysis of the project. These costs would be community costs, not project costs. Some type of Federal assistance may be available to the local communities to alleviate the impact.

10. Comment:

White-water rafting is mentioned seven times in the DEIS. Two of those instances are alluded to as alternative plans to the proposed project. The prediction that opportunities for white-water boating in the Dolores River will be increased as a result of project is presented in the remaining comments of the DEIS. On page A-34 of the DEIS, the statement occurs that estimated boating days would increase by 1,320 days to an average of 2,580 days by project allocation of water releases. On page B-50, only 20 to 25 percent of the boating opportunities are used. I don't think that this information is correctly represented and there is no statistical data to confirm the Bureau's conclusions. The answers to the following questions would help to shed some light on the problem.

1. What methods were employed to analyze the white-water boating data?
2. What sources were consulted and utilized?
3. Were commercial river outfitters contacted to contribute to the data gathering process?
4. What historical flow data was evaluated?
5. What was the gross revenue of commercial rivering operations acquired both directly by outfitters and received indirectly by the community through services and businesses?

Response:

As stated in response to comment No. 5 on pages I-18 and 19, revised estimates indicate a reduction of 31 to 42 percent in boating use as a result of the project. Data on which these estimates were based are available in Bureau of Reclamation offices in Salt Lake City, Utah, and Durango, Colo.

Bureau studies indicate an average net value of \$9 per boater-day, which would represent the unit loss for commercial outfitters. The amount of money spent in local communities by commercial boating groups is not known.

11. Comments:

How many user days does the Bureau predict under project conditions and how many boating days occur between 1,000 and 4,500 cfs without the project?

Response:

As discussed in Section C-13.g. the Bureau now estimates that the project would decrease boater-days from an average of 2,805 annually under present conditions to between 1,333 and 1,937 annually under project conditions. The boater days are based upon flows of 500 second-feet and above, occurring from snowmelt runoff.

12. Comment:

I believe that there will be a net decrease in the number of white-water boating user days under project conditions and that the loss in revenues incurred by commercial outfitters under project operation should be attributed to the cost of the project.

Response:

According to revised calculations, the project would reduce boater days. The loss is reflected in project economic analyses since the net increase in recreation use attributable to the project takes into account an annual loss of up to 1,472 boater-days (See Section C-13.g.).

13. Comment:

Final questions regarding white-water boating and project development: Are the four recreational facilities serving white-water boating downstream of the dam being developed as a cost assigned to the project? If the project is not constructed would the recreational development be constructed as a function of the potential Wild and Scenic River Management?

The aspect of white-water boating is addressed only as a footnote in section C, Environmental Impacts. I think that this is an inadequate discussion of the subject.

Response:

All the recreational facilities on the Dolores River are planned to serve white-water boating as well as other recreational uses, although the lower facilities will probably receive the most use by the boaters.

If the Dolores Project were constructed, the recreational facilities on the river would be constructed with project funds. If the Dolores Project were not constructed, and if the segment of the river below McPhee Dam site were added to the wild and scenic river system, the development of any recreational facilities would be the responsibility of the river management agencies.

Discussions of white-water boating in both Sections A-6.f.(1) and C-13.g. have been expanded since the draft environmental statement.

14. Comment:

Hunting and fishing are two more aspects of the project's recreational development that generate further questions. The estimate of 28,000 fisherman-days on page C-12 appears difficult to justify, particularly when only 10,000 fisherman-days would occur in the first 11 miles of river below the dam. Eighteen thousand fisherman-days in the river stretch from Bradfield Ranch to Slick Rock seems dubious because virtual absence of access, poor water quality resulting from tributaries, and warm water temperatures. Since the project will enhance the fishery, substantiation of 28,000 predicted fisherman-days is warranted. Temperature of the river water and dissolved oxygen levels dictate the viability of a trout fishery, predicted temperature and DO level curves versus river miles would help explain these questions.

Response:

The fishing and hunting use reported in the DES were provided by the U.S. Fish and Wildlife Service in its report on the project dated March 19, 1976 (See the Bibliography). The Fish and Wildlife Service relied heavily on the Colorado Division of Wildlife in arriving at the use estimates.

The Fish and Wildlife Service states that dividing the river into an upper 11-mile and a lower 45-mile section was done largely to show the difference expected in water temperature and accessibility. Other water quality parameters are not expected to be significantly different in the two sections because of lack of tributary inflow. The upper section would probably be managed as a put and take rainbow trout fishery while the lower section would probably go to a self-sustaining brown trout--smallmouth bass--catfish fishery, depending on the water temperature. Taking these factors into consideration, the Fish and Wildlife Service estimated that the fishing use on the upper section would be about one third more than on the lower section (900 versus 620 man-days per mile per year).

These are average-use figures which could be expected to occur over the 100-year period of analysis from 1975-2075.

15. Comment:

How far does the trout fishery expect to extend downriver from the project?

Response:

Biologists from the Bureau of Reclamation and the Colorado Division of Wildlife believe that the controlled water temperatures of releases at the multiple level outlet works would allow a trout fishery for about 11 miles. This length of river has been used as a basis for evaluation of the trout fishery.

16. Comment:

How many fisherman-days are predicted for each access point?

Response:

The fishing use was not broken down for each access point. The U.S. Fish and Wildlife Service estimated the use on a man-days-per-mile-per-year basis for the entire 56-mile section.

17. Comment:

What historical information would give insight to the prediction of 28,000 fisherman-days?

How was the figure of 28,000 arrived at?

Response:

These estimates were obtained from the U.S. Fish and Wildlife Service as explained in previous comments. The estimates are based on the type of the expected fishery (cold or warm water species), accessibility, water quality, and comparison with fishing use on existing fisheries in the State or region.

18. Comment:

Elaborate figures for hunting use are estimated for deer, elk, waterfowl, small game, bear, etc., both for historical activity (B-50) and for future increases (C-21). The numbers are projected within the range of ± 10 man-days.

Why is not the loss of hunting man-days with population reductions due to project impacts, inundation of migration routes, relocation of herds to over populated areas, and reduction of winter range evaluated and a cost per man-day assessed to the project?

Response:

As explained in Section C-13.g. and summarized in Table C-11, hunting opportunities are expected to be increased rather than reduced with the project, largely because of the specific measures for wildlife included in the project plan.

19. Comment:

The project impacts on wildlife deserves further debate. In my opinion, the substantial relocation of elk and mule deer, mountain lion and black bear is evitable with recreational activity around reservoir, snowmobile

use in the winter, traffic on the paved river road downstream of the reservoir. This is an important environmental impact, the result being the disruption of a fragile ecological balance of wildlife. What approximate numbers has the Bureau estimated for relocation? What losses will be incurred due to relocation to presently overpopulated areas? On page A-36 of the DEIS, 4,150 acres of land are cited to be acquired and improved for elk and deer habitat. This land is already serving as range area, particularly in the winter. The McPhee Reservoir alone will inundate 4,500 acres of winter range. This results in a net loss of range. What methods will be implemented to ensure the mitigation lands managed as a wildlife area will have a carrying capacity to compensate for the loss?

Response:

The Draft Environmental Statement pointed out that about 600 deer and 300 elk would be displaced by McPhee Reservoir. (The figure of 600 was erroneous and has been corrected to 450.) Adverse effects of roads, recreation sites, and other factors were also discussed but cannot be measured with any reasonable accuracy. No long-term population reductions are estimated by the Fish and Wildlife Service since the increased carrying capacity of the mitigation area would compensate for the lost carrying capacity within the reservoir.

Land acquisition alone is not intended to constitute the mitigation plan. The areas, which are now used primarily for livestock, would be developed and managed specifically for big game and would have an increased carrying capacity for those species. Even with mitigation, the loss of the land inside the waterline would be an unavoidable adverse effect, as is indicated in Chapter E of the statement.

Although some habitat for the mountain lion and black bear would be lost because of McPhee Reservoir and the recreation areas, the loss is not expected to be large enough to affect their populations. Only a small percentage of the available habitat would be lost, and there would consequently be no "substantial relocation" of these species. It is pointed out in Section C-7.c. that the estimated impacts are an insignificant decrease in the black bear population and no change in the mountain lion population.

20. Comment:

The DEIS reports on page B-35, 36, that no threatened or endangered species of fish exist in the project area. What is the potential habitat in the downstream portion of the Dolores River for threatened or endangered species? Does any habitat presently exist? What effects will the project have on this habitat? How will colder temperatures of the river water as a result of the project effect the existing warm water species in the lower river? The Wild and Scenic River Study Report, page 29, describes the lower river stretches as historical habitat for humpback suckers, the bonytail chub, and the Colorado Squawfish. What is the cost of installation and maintenance of fish screens? What would fishes losses be estimated at?

Response:

The Dolores River does not provide habitat for threatened or endangered species such as those listed above since these species are dependent upon a large river environment not found on the Dolores. Paul B. Holden and Clair B. Stalnaker^{1/} have concluded that any value of the Dolores for native fishes would be in its potential for providing the Colorado River with water flows that maintain a large river environment. It is not now in a natural condition, is not providing such flows, and may be considered neutral or perhaps even detrimental to the preservation of native fishes.

The Draft Environmental Statement points out that certain warm water species below McPhee Dam would be able to adapt to the colder temperatures, but that others would be displaced downstream below the influence of the lowered temperatures. The species in each category were also listed.

The feasibility of installing and maintaining fish screens at Great Cut Dike and the Dolores Tunnel is now being studied. The need for such screens will be determined when the study is completed. This information has been added to Section C-6.b.

21. Comment:

The subject of disturbance of peregrine falcons is approached with a degree of tactfulness. What is the potential of the peregrine falcon's using the river valley through the reservoir site as a hunting area, which historically it has served as? What procedure will be followed if the peregrines nest within the reservoir site? What effect will increased recreation in the river valley with the project in place have on potential hunting habitat?

Response:

Section C-8 points out that the reservoir would have a long-term beneficial effect by providing increased prey species. Sightings of peregrines at existing reservoirs indicate that these habitats are desirable as hunting areas. No suitable nesting sites are found within the reservoir basin; consequently, the potential for future nesting is essentially nonexistent.

Increased recreation along the river below McPhee Dam would tend to decrease the suitability as hunting habitat, although the sustained riverflows would probably increase the availability of prey species.

22. Comment:

Construction of McPhee Reservoir obviously will change the waterflow characteristics of the Dolores River downstream of the project. Several

^{1/} "Distribution of Fishes in the Dolores and Yampa River Systems of the Upper Colorado Basin," The Southwestern Naturalist, Vol. 19, No. 3 (1974).

aspects concerning the water related resources of the project are pursued in the following discussion. Examination of the Discharge-Frequency Curves for flooding of the Dolores River constructed by the Army Corp of Engineers in 1966, reveals that the spillway and outlet works could handle a 100 year flood effectively. Nevertheless, where would the water overflow and what would the ramifications be if the spillway and outlet works cannot handle the flood discharge? What would be the effect on the river channel immediately downstream of the spillway?

Response:

The spillway and outlet works at McPhee Dam would handle a 100-year flood without raising the reservoir water surface above the level of the active capacity. The peak flow of this flood is estimated at 13,300 second-feet, and the capacity of spillway and the outlet works would be 38,300 second-feet. In accordance with Bureau policy, the dam, spillway, outlet works, and reservoir surcharge capacity would be designed to safely pass the maximum probable flood, which is estimated at a peak flow of 46,100 second-feet. Spills would flow through the river channel below the dam in the same manner as they would without the dam.

23. Comment:

The regulation of flows in the Dolores River below McPhee Reservoir will alter the depositional and scouring characteristics of the river as indicated on pages C-3, C-13 of the DEIS. How will the channel bed and its materials be progressively modified downstream? Will this result in the formation of new sandbars or removal of sandbars since the sediment carrying capacity of the channel varies as the seventh power of the velocity? Will the water carrying capacity of the channel change thus altering the flooding characteristic of the river? How will the loss of the natural flushing phenomenon of flows above 3,000-4,000 cfs change the river environment?

Response:

Flows released at McPhee Dam would normally carry insignificant amounts of sediment. The reduction in turbidity could result in the disappearance of sandbars downstream, although some of the tributaries below the dam may introduce enough sediment to maintain the bars in certain reaches. The project would not be expected to alter the characteristics of the flood channel or the stream bottom. Most of the riverbed is lined with cobbles and boulders, and the proposed releases would not alter this condition.

The project would not eliminate flows of 3,000-4,000 second-feet; spring releases from the reservoir would vary from about 500 to 4,000 second-feet. It is pointed out in Section C-6.c. that flows at the lower end

of this range would enhance the biological productivity of the stream, but the higher flows would temporarily decrease the productivity and displace trout downstream.

24. Comment:

The groundwater table situation in the town of Dolores deserves some investigation. The groundwater table, particularly in the spring, is known to be very high. What will the groundwater table level below the town of Dolores be after the reservoir is filled? How much higher will this be than the existing water table? What seasonal fluctuations will occur? Will heaving and sweating of the expansive soils underlying the town cause any structural damage? This could possibly result in a severe problem years after the project was operating.

Response:

The ground water has been monitored regularly since June of 1975, when a grid of observation wells was installed. Readings indicate that the water table is at its highest point in February and at its lowest in September, with an average fluctuation of about 2 feet. At its highest level, the water varies from 2 to 5 feet below the ground surface.

The possibility of changes in the water levels or the seasonal fluctuation as a result of McPhee Reservoir would be quite remote. High river-flows would normally occur during the spring as a result of snowmelt runoff or during the fall as a result of thunderstorms. In both instances the reservoir water level should be low enough to handle the floods with no impact on the river or the ground water level at the town. In the spring the reservoir would be drawn down in anticipation of predicted runoff from snowmelt; in the fall, the reservoir would be low as a result of irrigation diversions.

The town is not underlain by expansive soils; it is underlain by sand, gravel, cobble, and boulders, forming a highly permeable material. These deposits do not change volume through wetting and drying cycles, and no structural damage would occur.

As an added precaution, the Bureau of Reclamation would continue to monitor the observation wells during project construction, and if the ground water table should unexpectedly rise because of reservoir filling, appropriate measures would be taken to control it.

25. Comment:

The existing sewage treatment plant at the town of Dolores also raises some cause for concern. Will the soils leach any nutrients or toxic materials into the reservoir from the removed waste treatment facilities? Page C-5 indicates the reduced possibility of occasional nutrient surge into the reservoir with removal of the Dolores waste treatment plant. What possibility still exists either from the soils underlying

the present facilities or the new facilities? Project funds will reimburse the town of Dolores for the removal of the existing plant at its replacement value. What is the cost of a new facility? Who pays the difference between the replacement value of the old facility and the cost of the new facility? Is this a cost that theoretically is assessed to the project? The statement on page C-28 regarding project funds allocated to relocate the Dolores sewage facilities is misleading, giving the impression the project funds would pay for the new facility entirely. This statement may be reworded to more closely coincide with the statement on page A-12.

Response:

The existing wastewater treatment facility would be removed and all associated soils (that may be contaminated) would be completely buried. The amount of transfer leaching through the soils would be minimal and eventually nonexistent. Soil contamination from the new facility would not occur because of design requirements. Nutrients, as a whole, are not considered to be a potential problem for this project's water quality. The statement in Section A-6.a.(2) has been corrected to show that project funds would be used to design, relocate, and construct a new treatment facility for the town of Dolores which meets modern effluent standards.

26. Comment:

It is conceivable that with a flood of sizable magnitude, the mine and mill tailing ponds at Rico could be washed away. Assuming the reservoir is under operating conditions, the toxic wastes (though highly diluted) could settle out in the reservoir. What would the effects of the metals and toxic substances have on the water supply for municipal-industrial users, irrigation, etc.? What effect would this have on aquatic life? Suppose the toxic substances stratify in the reservoir, would this permit increased exposure to those fish and invertebrates which exhibit low levels of tolerances? The potential hazards and costs to the community, should such disaster occur, appears significant enough to warrant a thorough analysis of the situation.

Response:

The effects of metals and toxics settling out would be minimal because of the total water chemistry. The high pH and alkalinity would promote a chemical condition whereby the substances would not be available for biological uptake and under this condition stratification of these substances is extremely remote. Should the hypothetical disaster occur, the effects would be very short lived and only a temporary inconvenience.

27. Comment:

The number of archaeological sites affected by the project is appalling. What cost is assessed to the project as a consequence of the deprivation of future examination and investigation by improved techniques and

advanced knowledge of the various cultures? If the project was not proposed, would the project area (including the reservoir) qualify as an archaeological district in the National Register of Historic Places?

Response:

Under the provisions of the Reservoir Salvage Act of 1960, as amended in 1974 (P.L. 93-291), up to 1 percent of project costs could be spent for mitigation of the impact on cultural resources. The Bureau of Reclamation recognizes that some sites would be adversely affected by the project and has so stated in Sections C-10 and E-3. No evaluations have been made of this effect in monetary terms, however, since there is no recognized method of doing so. In Section F-1 it is also recognized that from a preservation standpoint even those sites excavated and recovered could be considered a long-term loss. This, of course, would also be true if excavation were delayed until well into the future. The project area could be nominated as an archaeological district in the National Register of Historic Places. Whether it eventually received that designation would depend upon the recommendations of appropriate State and Federal agencies.

28. Comment:

In light of the recent disaster of Teton Dam, what precautions are being implemented to safeguard against a similar occurrence? What grouting techniques will be employed? Is the geology of the area capable of initiating an analogous set of circumstances? Who will review the Bureau's design and plans of the dam?

Response:

For the Dolores Project the Bureau of Reclamation is and has been making extensive subsurface and materials investigations. Dam design would be determined by the results of these investigations and tailored to the sites' geologic and topographic conditions. In addition, a design review process is being initiated by the Commissioner of Reclamation which will require that all dam design data be reviewed by independent engineering firms with expertise in dam design to ensure that data has not been overlooked or incorrectly analyzed. Once the dams were in place, conservative criteria would be followed in the initial filling of the reservoirs and instrumentation would closely monitor their behavior.

Although the grouting plan will not be finalized until all preconstruction drilling has been completed, grouting is usually performed in the following manner. At 10-foot intervals, along the entire dam axis from abutment to abutment, grout is pumped under pressure into grout holes up to 160 feet deep. Auxiliary holes are drilled and grouted if problems are encountered during grouting or the preconstruction drilling program indicates the need. The geology at McPhee Dam site consists of massive, stable sandstone which would provide a suitable foundation material. Also see response to comment No. 2 on page I-95.

29. Comment:

Previously, I was informed that the Dolores Project and the Paradox Valley Project were completely independent projects. What is implied by the statement on page A-2 that indicates the projects are "interrelated?"

Response:

The Dolores Project and the Paradox Valley Unit of the Colorado River Basin Salinity Control Project would be independently operated but would be interrelated in their effect on some environmental areas as discussed in Section C-14.

30. Comment:

If an agreement with MVIC and the Dolores Conservancy District is unable to be negotiated for the availability of project water (page A-1,2), what is the status of the project?

Response:

The availability of project water is dependent upon an agreement between the MVIC and the district. The project could not be built without such an agreement. Although a formal agreement has not been finalized, the MVIC has expressed a willingness to enter into such an agreement.

31. Comment:

Will the river road between McPhee Dam and Bradfield Ranch be paved with project funds? What will be the environmental impacts, particularly on wildlife, i.e., elk and mule deer migration routes?

Response:

The road would not be paved as part of the project. Increased recreational travel along the road would disturb wildlife and perhaps increase mortality rates. The increased traffic would occur primarily in the summer and should thus have no significant effect on the deer and elk using the area in the winter.

32. Comment:

On page A-28, the Great Cut Pumping Plant, based on historical information, would have been required to operate only 15 of 46 years. Can it be construed that the pumping plant operation will be necessary only one out of every three years in the future?

Response:

The Great Cut Pumping Plant would operate every year although some of the individual units would not operate each year. The statement in Section A-6.d.(4) has been modified to be more explicit and now points

out that "eight pumping units would deliver water to the Dove Creek Canal each year, and two pumping units would deliver water to the "U" Lateral whenever necessary. In the 46-year project operation study, pumping to the lateral was required in 15 years, usually from June through September." This distinction is previously introduced in Section A-5.b.(2), which now states that "the Great Cut Pumping Plant would be constructed at the dike to lift water to the Dove Creek Canal whenever the canal was in operation, since its initial elevation is higher than the maximum water surface elevation in the reservoir. The "U" Lateral would be fed by gravity at most times, but pumping through the Great Cut Pumping Plant would also be necessary when the reservoir was at reduced capacity."

33. Comment:

Why can't the existing MVIC tunnel be utilized instead of constructing the new Dolores Tunnel?

Response:

During the project advance planning studies, the Bureau of Reclamation investigated the possibility of rehabilitating the MVIC tunnel for use under project conditions, but the construction of a new tunnel was determined to be more practical and economical. The existing tunnel was built about 86 years ago and is now in poor condition, so that rehabilitation would be required for future use with or without the project. The Bureau considered the installation of a steel pipe as a liner for the tunnel, which would result in a capacity of about 320 second-feet, considerably less than the 520 second-feet required for project use. A further complication is presented by the location of the tunnel inlet, which is at an elevation approximately equivalent to the middle of the reservoir's active capacity. Consequently, stored water could not always be diverted through the tunnel. It is also in an area where sediment deposits are expected. Temporary problems during construction would also occur since the existing tunnel is used year-round for municipal and industrial deliveries in addition to the seasonal use for irrigation deliveries.

34. Comment:

The DEIS cites noise levels that will be maintained on page D-1. How will noise control be regulated? What are the repercussions if the limits are exceeded?

Response:

As indicated in Section D-2, the construction specifications will require the contractor to meet applicable Federal, State, and local regulations for such matters as noise control. Bureau of Reclamation inspectors would be responsible for seeing that the regulations are met and could, if necessary, levy fines or stop work to ensure compliance.

35. Comment:

If the ability to contribute salt to the San Juan River would diminish with continuous operation, why wouldn't the ability to absorb salts in the Mancos area show similar decline?

Response:

Soils underlain by Mancos Shales have excess salts and therefore do not have the ability to absorb salts. Soils in the Dove Creek area, which are underlain by sandstone of the Dakota Formation, are not saturated with salts and therefore have the ability to absorb additional salts. The rate of absorption would decline, although so slowly as to be unnoticeable.

36. Comment:

The statement, "Water uses could be changed in the future, however." appears on page G-1 of the DEIS. Please explain the text and scope of this statement. Could the water be reallocated in the future, that is, from irrigation to municipal-industrial water, from recreation uses (white-water boating) to irrigation, or for an entirely new purpose? Could it be reallocated to a different project, for example, coal mining? What would happen to the cost effectiveness of the project in this instance? Would such redistribution of the water resources be based on decisions regarding economic and environmental feasibility?

Response:

Water use could change in the future if such change were the expressed desire of the water conservancy districts involved, if such change met with the approval of the Secretary of Interior, and if such change were made in compliance with the National Environmental Policy Act. As an integral part of NEPA compliance, all interested parties, whether Federal, State, or private, would have the opportunity to make comments and recommendations on the proposed conversion. The cost effectiveness could only be determined by conditions prevailing at the time of the change.

37. Comment:

Does the statement of page H-9, third sentence, first paragraph, imply that the existing plan for a possible designation of the Dolores River as a possible Wild and Scenic River would no longer be valid if the Dolores Project were not constructed?

Response:

The statement is not intended to imply that the recommendations of the Wild and Scenic River Study would no longer be valid. It does imply, however, that without the Dolores Project a fundamental premise of the study--the assumption that the project will be built--would be altered and that a reevaluation of the river may be desirable as a result. The statement has been revised to be more precise.

38. Comment:

What fate lies in store for the McPhee Reservoir and Dolores Project, when the life of the project is complete, the demands become greater than the project can meet, the reservoir silts up, or the project and reservoir outlive their usefulness?

Response:

If future demands were to become greater than the project could meet, additional water sources could be developed, existing water supplies could be converted from one use to another, the growth of the area could slow down or halt, or a combination of these changes and perhaps others could occur.

The usefulness of the reservoir would not be affected significantly by sediment deposits. The sediments deposited in a 100-year period would consist of about 8,200 acre-feet in the inactive capacity and 2,800 acre-feet in the active capacity, so that only about 1 percent of the active capacity would be lost. At this rate, the water supply would not be significantly affected for several hundred years, and proper dredging at the upper end of the reservoir could extend its useful life indefinitely. This estimate is based upon the assumption that sedimentation rates would not be altered significantly by changes in climate, ground cover, and land use in the upper Dolores River Basin. Sediments near the dam would be flushed downstream through the outlet works. Consequently, the operation of the dam would not be affected.

David L. Cradall
Regional Director
Bureau of Reclamation
Upper Colorado Regional Office
P.O. Box 11568
Salt Lake City, Utah 84147

RE: Response to the Draft Environmental Impact Statement
the Authoized Dolores Project, Colorado.

Sirs:

I appreciate the chance to respond to the Draft Environmental Impact Statement. Unfortunately I was unable to speak in Cortez because of prior commitment, so I am writting this letter.

I think that the project is economically unfeasible from the point of the American taxpayer. The following points are directed to the Cost-Benefit analysis evaluation. I understand that the project has been authorized by Congress at a discount rate of $3 \frac{1}{4}\%$. Can the Bureau of Reclamation show the economic analysis at the true dollar value? If it is not possible can you explain why not? I understand that the Water Resources Council has established the discount rate at $6 \frac{1}{8}\%$ for projects undertaken by the Bureau.

Based on the discount rate of $6 \frac{1}{8}\%$ the total Cost-Benefit ratio is .72:1. Direct benefits are only .57:1. These figures are arrived at using the Bureau's own figures with the Towaoc irrigation development.

An earlier project description from Feb. 1975 predicted a depletion of 91,000 acre feet of water from the Colorado river. In the DEIS there is a projected net depletion of 80,900 acre feet. What facts do you have to justify the lower figure? Is the depletion of 80,900 acre feet put in the Cost-Benefit as an accountable cost to the project? What is the estimate that your office has for the cost of water to downstream users? With the water from the Yuma Project, Valley Division selling for \$22.50/5AF \$4.50/AF in excess of 5AF, plus \$.25 for storage of water taken below Hoover Dam it could be figured that the water could have a worth of \$384,275.00. This only represents O&M assessments. I believe that the water is worth more than the figures given but those figures are used for proof of what the water is worth. Has this been figured as a cost to the project?

There is a big issue about unemployment. Page E-46 of the DEIS cites the unemployment figures of Montezuma and Dolores counties, focusing on the problem of Indian and Spanish-American unemployment. \$580,000/ year is placed as a benefit to the area by hiring unskilled labor. Page C-29 of the DEIS states that, 'Although most of the unskilled

labor would come from the local area, about 85% of the skilled labor would come from outside the area.' How can the fact that so much outside labor comes from the outside improve the standard of living for the people already in the area and living in depressed conditions? Per capita earning in the area will rise but will the living standard for the poor already living in the area also rise? Page C-29 DEIS says that 6,270 jobs will be provided. How many jobs will the locals get? Page A-41 DEIS says that a peak of 700 jobs will be provided. Page C-29 DEIS says that 1,300 jobs will be provided at the peak period. Why the 2 different figures? With which figures were the wages of the project figured? Could this change the benefit analysis?

With the influx of outside labor housing cost will probably rise because of increased demand. This could cause hardships with the poverty level residents of the area. Could this be figured as an indirect negative Cost-Benefit? If not, why not?

One of the aims of the project is for irrigation. Page A-3, DEIS says that the irrigated land will be used mainly for livestock feed in the Dove Creek area. The report focuses on the fact that a heavy emphasis will be put on livestock and livestock feeds. How will the increase in livestock in the area affect the cattle market in the area? The ranchers in the Durango area already complain of a depressed cattle prices. It seems as though more ranches in the local market will lower prices even more.

Whitewater rafting needs to be looked at from both the stand point of the recreational rafter and the commercial rafter. On page B-50 DEIS, it says that only 20-25% of boating opportunity days were used. Where did the Bureau get it's whitewater data? How did the Bureau come to it's conclusion? Which commercial outfitters were polled for their suggestions? How much money is made on the river by the outfitter and how much does the local market make indirectly because of boating, commercial and recreational? I have rafted the river under 1,000cfs and I know people who have rafted the river over 4,500cfs. Should these flows that are not included in your limits be included?

Hunting and fishing are some of the recreational aspects of the project. Page C-12 says that 10,000 fisherman days are expected on the first 11 miles of the river. County highway 504 allows for relatively easy access to the river. How do you justify 28,000 user days in the 4 access points? Ease of access to the Little Gyp Valley and Mountain Sheep Point is not that easy. From Bradfield Ranch to Slickrock is very difficult except by raft. The exception is Mountain Sheep Point road.

How can you justify the greater fishing pressure at Ground hog Reservoir, Ground hog Creek, West Dolores and the

Dolores River above the town of Dolores with the project? Where did these figures come from?

On page A-36 4,150 acres of land is said to be acquired for deer and elk habitat. Is this land a benefit or a cost to the project? It seems to be a cost since the land is already being used by the animals at the present. Will grazing be allowed on the property?

The town of Dolores will probably undergo some growth. The sewer plant will have to be moved and project funds will be used to reimburse the town for the old sewer. Who pays the cost of a new sewer if Dolores decides to build a new and larger system? Has this been put on the project as a cost?

The facilities of Dove Creek and Cortez will probably be strained due to the influx of construction workers. Education, health services, police and fire protection and water and sewer will have to be expanded. Page C-27 said that services will have to be expanded much sooner with the project. Many of the services are federally funded or federal funding could be made available to the area. Has this possible federal spending been reflected as a cost to the project? Again if not, why not?

At the present time a MVI tunnel is being used. Why must the Dolores tunnel be built and MVI tunnel plugged? Wouldn't it be cheaper to use the old tunnel?

If the Paradox Valley and McElmo Creek units are 'interrelated' would it be possible to place the cost on the Dolores project?

What safeguards are being taken in light of the recent Teton dam disaster?

What is the environmental impact on elk and mule deer because of the paving of county road 504? Is the paving cost a cost to the project?

Page D-1 says that the noise limits will be set. What happens if and when the noise limits are exceeded either by accident or on purpose? Who will decide what will happen and who will file suit if the limits are exceeded?

Would the dam site be possibly included in the Wild and Scenic study if the project was not completed?

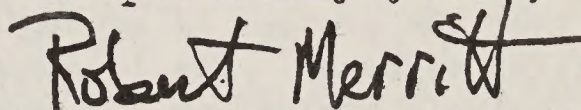
What would happen to the reservoir if a flood came down and wiped out the mine tailing ponds in Rico? Wouldn't the tailings settle out in the reservoir bottom once the reservoir was filled. If the tailings did settle out what

would be the effect on M&I water, aquatic life and animals using the water? Since a tailing pond broke in Silverton during the summer of 1975 shouldn't this possibility be investigated fully?

I feel that the answers to these questions may lead to a reevaluation of the worthyness of this project. I do not feel that the American people can afford so questionable a project.

I hope that these few comments will give a more extensive outlook as to the impact of the project.

Respectfully yours,

A handwritten signature in dark ink, appearing to read "Robert Merritt". The signature is stylized with a large, sweeping initial 'R' and a long horizontal stroke extending to the right.

Robert Merritt

March 7, 1977

Memorandum

To: Files

Subject: Response to Robert Merritt Letter on Dolores Project Draft
Environmental Statement

1. Comment:

I think that the project is economically unfeasible from the point of the American taxpayer. The following points are directed to the Cost-Benefit analysis evaluation. I understand that the project has been authorized by Congress at a discount rate of 3 1/4%. Can the Bureau of Reclamation show the economic analysis at the true dollar value? If it is not possible can you explain why not? I understand that the Water Resources Council has established the discount rate at 6 1/8% for projects undertaken by the Bureau.

Based on the discount rate of 6 1/8% the total Cost-Benefit ratio is .72:1. Direct benefits are only .57:1. These figures are arrived at using the Bureau's own figures with the Towaoc irrigation development.

Response:

The Secretary of the Treasury has determined that the appropriate discount rate to be used in judging the economic feasibility of the Dolores Project is 3 1/4 percent. This rate was current at the time the project was authorized and its use also has the concurrence of the Water Resources Council. The Bureau of Reclamation has not made an analysis of the Dolores Project's feasibility using a 6 1/8 percent discount rate. In accordance with Department of the Interior policy, the economic data are not included in the environmental statement but are available in Bureau of Reclamation offices in Salt Lake City, Utah, and Durango, Colo.

2. Comment:

An earlier project description from Feb. 1975 predicted a depletion of 91,000 acre feet of water from the Colorado river. In the DEIS there is a projected net depletion of 80,900 acre feet. What facts do you have to justify the lower figure? Is the depletion of 80,900 acre feet put in the Cost-Benefit as an accountable cost to the project? What is the estimate that your office has for the cost of water to downstream users? With the water from the Yuma Project, Valley Division selling for \$22.50/5AF \$4.50/AF in excess of 5AF, plus \$.25 for storage of water taken below Hoover Dam it could be figured that the water could have a worth of \$384,275.00 This only represents O&M assessments. I believe that the water is worth more than the figures given but those figures are used for proof of what the water is worth. Has this been figured as a cost to the project?

Response:

These questions are addressed in response to comment No. 2 on page I-180.

3. Comment:

There is a big issue about unemployment. Page B-46 of the DEIS cites the unemployment figures of Montezuma and Dolores counties, focusing on the problem of Indian and Spanish-American unemployment. \$580,000/year is placed as a benefit to the area by hiring unskilled labor. Page C-29 of the DEIS states that, "Although most of the unskilled labor would come from the local area, about 85% of the skilled labor would come from outside the area." How can the fact that so much outside labor comes from the outside improve the standard of living for the people already in the area and living in depressed conditions? Per capita earning in the area will rise but will the living standard for the poor already living in the area also rise? Page C-29 DEIS says that 6,270 jobs will be provided. How many jobs will the locals get? Page A-41 DEIS says that a peak of 700 jobs will be provided. Page C-29 DEIS says that 1,300 jobs will be provided at the peak period. Why the 2 different figures? With which figures were the wages of the project figured? Could this change the benefit analysis?

Response:

These questions have been addressed on page I-182 in response to comment No. 6.

4. Comments:

With the influx of outside labor housing cost will probably rise because of increased demand. This could cause hardships with the poverty level residents of the area. Could this be figured as an indirect negative Cost-Benefit? If not, why not?

Response:

The Bureau of Reclamation agrees that housing costs would probably rise during the peak years of construction and thus this type of inflation would cause hardship to poverty level residents, particularly those residents living in rental housing who did not gain employment from the project. This adverse effect is addressed in the statement in sections C-13.b. and E-5. It has not been computed as a negative externality in the benefit-cost analysis, however, since there is no generally recognized way of assessing it in monetary terms nor is it within Reclamation's authority to attempt such a computation.

5. Comment:

One of the aims of the project is for irrigation. Page A-3, DEIS says that the irrigated land will be used mainly for livestock feed in the Dove Creek area. The report focuses on the fact that a heavy emphasis will be put on livestock and livestock feeds. How will the increase in livestock in the area affect the cattle market in the area? The ranchers in the Durango area already complain of a depressed cattle prices. It seems as though more ranches in the local market will lower prices even more.

Response:

Cattle prices are not established on a local level. These prices are established on a national basis, therefore any increase in livestock production on a local level would have no effect on prices.

6. Comment:

Whitewater rafting needs to be looked at from both the stand point of the recreational rafter and the commercial rafter. On page B-50 DEIS, it says that only 20-25% of boating opportunity days were used. Where did the Bureau get it's whitewater data? How did the Bureau come to it's conclusion? Which commercial outfitters were polled for their suggestions? How much money is made on the river by the outfitter and how much does the local market make indirectly because of boating, commercial and recreational? I have rafted the river under 1,000 cfs and I know people who have rafted the river over 4,500 cfs. Should these flows that are not included in your limits be included?

Response:

These issues have been answered in the responses to comment No. 10 on page I-184 and comment No. 11 on page I-185.

7. Comment:

Hunting and fishing are some of the recreational aspects of the project. Page C-12 says that 10,000 fisherman days are expected on the first 11 miles of the river. County highway 504 allows for relatively easy access to the river. How do you justify 28,000 user days in the 4 access points? Ease of access to the Little Gyp Valley and Mountain Sheep Point is not that easy. From Bradfield Ranch to Slickrock is very difficult except by raft. The exception is Mountain Sheep Point road.

Response:

The number of access points did not enter into the computations used to estimate fisherman days use. The fisherman use figures were based on an estimate of 620 man-days per mile per year for the lower 45 mile section of stream. This estimate was obtained from the U.S. Fish and Wildlife Service with the aid of the Colorado Division of Wildlife.

8. Comment:

How can you justify the greater fishing pressure at Ground Hog Reservoir, Ground hog Creek, West Dolores and the Dolores River above the town of Dolores with the project? Where did these figures come from?

Response:

McPhee Reservoir would provide the Montezuma Valley Irrigation Company with an opportunity to stabilize the existing Ground Hog Reservoir. As pointed out in Section C-6.f, this stabilization would increase the productivity and consequently attract greater fishing use. Groundhog Creek would have continual flows under project conditions, as shown on Table C-1. In comparison, without the project the stream would be dewatered for extended periods during the summer in normal and dry years. The improved flows would result in increased fishing opportunities in Groundhog Creek and in the Dolores and West Dolores Rivers downstream from the mouth of Groundhog Creek. The man-days of fishing resulting from the project have been estimated by the Fish and Wildlife Service.

9. Comment:

On page A-36 4,150 acres of land is said to be acquired for deer and elk habitat. Is this land a benefit or a cost to the project? It seems to be a cost since the land is already being used by the animals at the present. Will grazing be allowed on the project?

Response:

The cost of the wildlife mitigation area would be a project cost. The areas would be managed specifically for wildlife, and other uses could be allowed only if they were consistent with wildlife management.

10. Comment:

The town of Dolores will probably undergo some growth. The sewer plant will have to be moved and project funds will be used to reimburse the town for the old sewer. Who pays the cost of a new sewer if Dolores decides to build a new and larger system? Has this been put on the project as a cost?

Response:

As explained in Section A-6.a.(2), project funds would be provided for the design and construction of a new sewage treatment plant of the same capacity and functional performance as the existing plant. The plant would meet present day effluent standards and would also provide the degree of treatment necessary to meet higher discharge standards that could be expected because of McPhee Reservoir. Reclamation has no authority to fund an enlarged plant in anticipation of future growth.

11. Comment:

The facilities of Dove Creek and Cortez will probably be strained due to the influx of construction workers. Education, health services, police and fire protection and water and sewer will have to be expanded. Page C-27 said that services will have to be expanded much sooner with the project. Many of the services are federally funded or federal funding could be made available to the area. Has this possible federal spending been reflected as a cost to the project? Again if not, why not?

Response:

The potential costs of federal assistance for providing community facilities and services have not been included as project costs. Although construction of Dolores Project would likely advance the timing of the need for these facilities, absence of the project would not eliminate the need. Federal assistance to cities for community facilities and services is available to alleviate the impact of growth from any source. Increased taxes resulting from increased employment and spending in the area will in the long run compensate for the increased cost of facilities. No provisions have been made in the project authorization legislation to include these increased costs as project costs.

12. Comment:

At the present time MVI tunnel is being used. Why must the Dolores tunnel be built and the MVI tunnel plugged? Wouldn't it be cheaper to use the old tunnel?

Response:

During the project advance planning studies, the Bureau of Reclamation investigated the possibility of rehabilitating the MVIC tunnel for use under project conditions, but the construction of a new tunnel was determined to be more practical and economical. The existing tunnel was built about 86 years ago and is now in poor condition, so that rehabilitation would be required for future use with or without the project. The Bureau considered the installation of a steel pipe as a liner for the tunnel, which would result in a capacity of about 320 second-feet, considerably less than the 520 second-feet required for project use. A further complication is presented by the location of the tunnel inlet, which is at an elevation approximately equivalent to the middle of the reservoir's active capacity. Consequently, stored water could not always be diverted through the tunnel. It is also in an area where sediment deposits are expected. Temporary problems during construction would also occur since the existing tunnel is used year-round for municipal and industrial deliveries in addition to the seasonal use for irrigation deliveries.

13. Comment:

If the Paradox Valley and McElmo Creek units are 'interrelated' would it be possible to place the cost on the Dolores project?

Response:

The Paradox Valley and McElmo Creek Units would be indirectly related to the Dolores Project in their effect on some environmental areas. Costs of the developments would be handled separately under provisions established by Congress in legislation authorizing construction. The Dolores Project was authorized by the Colorado River Basin Act of September 30, 1968 (Public Law 90-537) while the Paradox Valley Unit was authorized by the Colorado River Basin Salinity Control Act (Public Law 93-320). The McElmo Creek Unit has not been authorized for construction but was authorized for feasibility study by the Colorado River Basin Salinity Control Act.

14. Comment:

What safeguards are being taken in light of the recent Teton dam disaster?

Response:

For the Dolores Project the Bureau of Reclamation is and has been making extensive subsurface and materials investigations. Dam design would be determined by the results of these investigations and tailored to the sites' geologic and topographic conditions. In addition a design review process is being initiated by the Commissioner of Reclamation which will require that dam designs be reviewed by independent engineering firms with expertise in dam design to insure that data has not been overlooked or incorrectly analyzed. Once the dams were in place, conservative criteria would be followed in the initial filling of the reservoirs and instrumentation would closely monitor their behavior.

15. Comment:

What is the environmental impact on elk and mule deer because of the paving of county road 504? Is the paving cost a cost to the project?

Response:

County road 504 would not be paved as part of the project, and Reclamation is not aware of any other plans dealing with the road. As stated in Section A-6.a.(2), the proposed access road to McPhee Dam would be paved, and the probable impacts of this road on deer and elk are discussed in Sections C-7.b.(1) and C-7.b.(2). This subject will be investigated further as a part of the wildlife mitigation area management plan being formulated by the Forest Service, Colorado Division of Wildlife, and the Bureau of Reclamation.

16. Comment:

Page D-1 says that the noise limits will be set. What happens if and when the noise limits are exceeded either by accidents or on purpose? Who will decide what will happen and who will file suit if the limits are exceeded?

Response:

This concern is answered on page I-195.

17. Comment:

Would the dam site be possibly included in the Wild and Scenic Study if the project was not completed?

Response:

If the project were not constructed, only further studies could determine if the McPhee Dam and Reservoir site should be included in the wild and scenic river designation since it was specifically excluded from the original study.

18. Comment:

What would happen to the reservoir if a flood came down and wiped out the mine tailing ponds in Rico? Wouldn't the tailings settle out in the reservoir bottom once the reservoir was filled. If the tailings did settle out what would be the effect on M&I water, aquatic life and animals using the water? Since a tailing pond broke in Silverton during the summer of 1975 shouldn't this possibility be investigated fully?

Response:

This question is answered in response to comment 26 on page I-192.

3077 East Fourth Avenue
Durango, Colorado 81301
24 December 1976

Mr. Roland G. Robison, Jr.
Hearing Officer, Hearing on the Draft Environmental Impact Statement - Dolores River Project
Dept. Interior
Office of the Regional Solicitor
Room 6201, Federal Building
Salt Lake City, Utah 84147

Dear Sir:

Please include this statement in the record of the local hearing on the Draft Environmental Impact Statement for the Dolores River Project, held in Cortez, Colorado earlier this month.

Insufficient attention has been paid in the statement prepared by the Bureau of Reclamation to the following points:

1. Potential benefits to the nation as a whole of not using Dolores River water to irrigate land now in dryland agriculture.
2. Potential sociological disruptions arising out of the displacement of the present inhabitants by outsiders with previous experience in irrigated agriculture.
3. Possible loss of project values through the diversion of land from commercial farming into small tracts devoted to horse pastures and rural residences for urban workers as is occurring in previously constructed reclamation projects in Southwest Colorado.

Expanding on each of these topics in turn, I would say that the forage crops and livestock grains expected to be produced under irrigation on these lands will be less useful in the national economy in the future than either the vegetables, fruit, and fiber that could result from its use in California, Arizona, and Republic of Mexico, or the pinto beans and bread wheats that would continue to be produced on the unirrigated lands.

Almost no attention was given to the problem of adapting the existing farmers to a style of agriculture radically different than that they are practicing now. Several have been heard to comment that they have no inclination to take up the new and unappealing procedures required by irrigation and hope only to sell out at a profit. This trend will be reinforced by the demographic structure, age-wise, of the farm population.

The statement includes no surveys of known effects of two previously constructed reclamation projects, the Pecos River and Florida River Projects. It seems irresponsible to ignore the information on both good and bad results ^{available} from these projects and to fail to use it to improve planning for the projects proposed and/or currently under construction.

I hope some attention will be paid to these points before the impact statement is finalized.

Sincerely,
Albert W. Spencer

January 21, 1977

Memorandum

To: Files

Subject: Response to Albert W. Spencer Letter of December 24, 1976,
on Dolores Project Draft Environmental Statement

1. Comment:

1. Potential benefits to the nation as a whole of not using Dolores River water to irrigate land now in dryland agriculture. Expanding on each of these topics in turn, I would say that the forage crops and livestock grains expected to be produced under irrigation on these lands will be less useful in the national economy in the future than either the vegetables, fruit, or fiber that could result from its use in California, Arizona, and Republic of Mexico, or the pinto beans and bread wheats that would continue to be produced on the unirrigated lands.

Response:

As set forth in the Colorado River Compact, the State of Colorado, like all other Basin States and Mexico, is entitled to utilize a specified quantity of water from the Colorado River drainage. The Dolores Project utilizes a portion of Colorado's apportioned rights.

2. Comment:

Potential sociological disruptions arising out of the displacement of the present inhabitants by outsiders with previous experience in irrigated agriculture. Almost no attention was given to the problem of adapting the existing farmers to a style of agriculture radically different than that they are practicing now. Several have been heard to comment that they have no inclination to take up the new and unappealing procedures required by irrigation and hope only to sell out at a profit. This trend will be reinforced by the demographic structure, agewise, of the farm population.

Response:

Farmers would be required to petition for Dolores Project water. Those farmers who do not desire project water would not receive it and could continue their dryland operation. It is doubtful that any present inhabitants would be displaced by outsiders.

3. Comment:

Possible loss of project values through the diversion of land from commercial farming into small tracts devoted to horse pastures and rural residences for urban workers as is occurring on previously constructed reclamation projects in Southwest Colorado. The statement includes no surveys of known effects of two previously constructed reclamation projects, the Pine River and Florida River Projects. It seems irresponsible to ignore the information on both good and bad results available from these projects and to fail to use it to improve planning for the projects proposal and/or currently under construction.

Response:

Colorado Senate Bill 35 prohibits the creation of tracts smaller than 35 acres in size without complying with stringent subdivision regulations. This legislation greatly reduces the likelihood that farms would be divided into small tracts, horse pastures, and rural residences for urban workers.

No change in ownership is expected on the Towaoc Indian lands. However, an account charge would be levied on all farm units purchasing project water in the Montezuma Valley and Dove Creek areas in order that the burden of paying project irrigation costs would be shared by commercial full-time farms and small part-time farms whose operators generally receive the major part of their income from off-farm employment. No account charges have been estimated for the Towaoc Indian area.

December 18, 1976

Gilbert G. Stamm, Commissioner
U.S. Department of Interior
Bureau of Reclamation
Upper Colorado Region
P.O. Box 11568
Salt Lake City, Utah 84147

Dear Sir,

After reviewing the Draft Environmental Statement, Dolores Project, Colorado, I appreciate the opportunity to address this proposal and its purported environmental impact.

As a citizen and Colorado resident, I understand that the Colorado River Storage Project, as envisioned, would authorize the construction of a total of seven major water reclamation projects here in the state. Separate environmental impact statements dealing with a number of the projects have been released, but as yet, there has been no attempt to publicly assess their cumulative effects on wildlife and water quality. I believe that such a comprehensive, programmatic E.I.S. is essential before the true consequences of this enterprise can be accurately appraised.

As a taxpayer, I am disturbed to learn that the McPhee Reservoir may be priced at over 200 million dollars. Off stream storage sites have not been seriously considered or described in this draft statement. Such a site could successfully preserve the integrity of this free flowing river. Now the Dolores River is a potential addition to the National Wild and Scenic Rivers system. The area involved in the proposed reservoir constitutes an important and irreplaceable transition zone between a mountain alpine ecosystem and a desert canyonland ecosystem. I believe that the loss of this habitat should be reflected in the cost-benefit analysis of this project. Furthermore, I am not satisfied that the draft statement has fully considered the impact this project would have on the status of the Dolores River as a Wild and Scenic River.

I am aware that the proposed project area is historically and culturally significant for various reasons. Evidence of Anasazi life and existing archeological sites would be sacrificed. This loss should be accounted for in cost estimates. Water losses due to surface evaporation should be estimated and revealed. How will this project benefit the national economy?

Thank you for the opportunity to comment on this Draft Environmental Statement, Dolores Project.

Sincerely,

January 21, 1977

Memorandum

To: Files

Subject: Response to Steven Cone Letter of December 8, 1976, on Dolores Project Draft Environmental Statement

1. Comment:

As a citizen and Colorado resident, I understand that the Colorado River Storage Project, as envisioned, would authorize the construction of a total of seven major water reclamation projects here in the state. Separate environmental impact statements dealing with a number of the projects have been released, but as yet, there has been no attempt to publicly assess their cumulative effects on wildlife and water quality. I believe that such a comprehensive, programmatic E.I.S. is essential before the true consequences of this enterprise can be accurately appraised.

Response:

See Section C-14.

2. Comment:

As a taxpayer, I am disturbed to learn that the McPhee Reservoir may be priced at over 200 million dollars. Off stream storage sites have not been seriously considered or described in this draft statement. Such a site could successfully preserve the integrity of this free flowing river. Now the Dolores River is a potential addition to the National Wild and Scenic Rivers system. The area involved in the proposed reservoir constitutes an important and irreplaceable transition zone between a mountain alpine ecosystem and a desert canyonland ecosystem. I believe that the loss of this habitat should be reflected in the cost-benefit analysis of this project. Furthermore, I am not satisfied that the draft statement has fully considered the impact this project would have on the status of the Dolores River as a Wild and Scenic River.

Response:

Several alternatives to McPhee Reservoir were studied and were rejected for various reasons. There were no off-stream sites available that would store sufficient water for all the project purposes. In addition, most off-stream storage sites would require pumping which would significantly increase the costs of the project. The Wild and Scenic River Study conducted by the Bureau of Outdoor Recreation and Forest Service assumed that McPhee Reservoir was in place. The study also concluded that the Dolores Project would enhance the wild and scenic value of the Dolores River by ensuring that a live stream would be maintained below McPhee Dam. The estimated costs of the land needed to build and operate project features have been included in the benefit-cost analysis.

3. Comment:

I am aware that the proposed project area is historically and culturally significant for various reasons. Evidence of Anasazi life and existing archeological sites would be sacrificed. This loss should be accounted for in cost estimates.

Response:

Project cost estimates include allowances for a program for archaeological preservation.

4. Comment:

Water losses due to surface evaporation should be estimated and revealed.

Response:

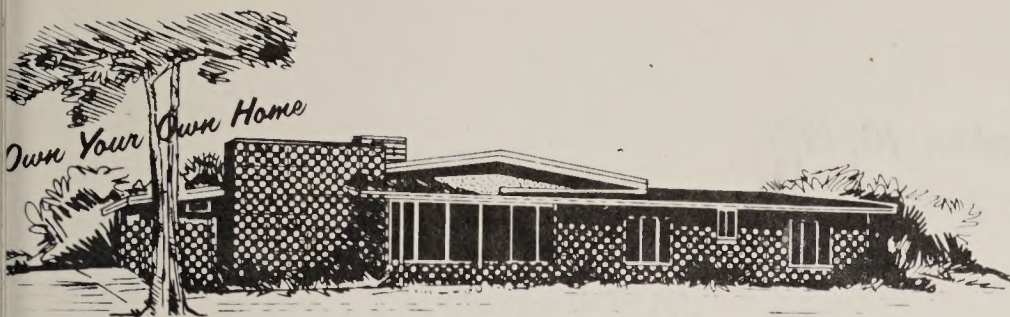
As discussed in Section C-4, the reservoir evaporation losses attributable to the Dolores Project would be approximately 6,300 acre-feet annually.

5. Comment:

How will this project benefit the national economy?

Response:

It would provide jobs, stabilize the area's agricultural base, and result in the increased production of livestock feed and food crops.



FOUTZ REALTY - BLOOMFIELD

P. O. BOX 1088 PHONE 632-3353

226 W. GEO. SALMON DR.

BLOOMFIELD, N. M. 87413

November 10, 1976

BR Regional Director

David Crandall

Room 7416

125 S. State Street

Salt Lake City, Utah 84147 Refer: Dolores Project

Dear Sir,

I am writing in regard to the Dolores Project. We support the construction of McPhee Dam and the balance of the project.

We have owned property on the Dolores River for 12 years, and have known the river, summer and winter. Altho where we are, the river always has adequate water, farther on there are many times it is just a trickle.

The Spring run-off could be controlled and utilized by this Project. The assets from the project should be obvious, especially to anyone familar to the area. There is so much land that can be productive with water available, including Ute & Navajo Reservations Areas.

A "Wild and Scenic" river sounds attractive, but 1000 times more people would utilize and enjoy the lake created by the Dams. I'm not sure about "flood control" in our area, as we are up stream from the Dam area, but we are always concerned at the spring run-off.

November 10, 1976

Page 2

We improved our lives by replacing the ice box with a refrigerator,
so lets improve this area with a controlled water supply, and highest
and best use of the Dolores and San Juan Rivers.

Sincerely,

Grace Welsch

Grace Welsch

GW:jh

cc: Wayne Cook

cc: The Dolores Star

P.O. Box 235
Dolores, Colorado 81321

November 12, 1976

Mr. David Crandall, Director
Bureau of Reclamation
Room 7416
125 So. State Street
Salt Lake City, Utah 84147

Dear Mr. Crandall:

The purpose of this letter is to inform you and all interested parties of my support of the Dolores River Project.

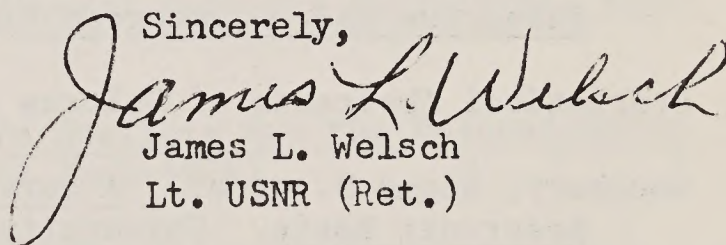
I am a property owner on the Dolores River, East of Dolores. For several years, I have been interested in this project and it's ultimate construction. From my investigation, the benefits far outweigh the adverse effects. Just the conservation of the spring runoff water would make the project profitable. Other benefits such as irrigation, flood control and recreation are other important considerations.

The economic advantages are apparent and greatly need in this area.

While the "Wild and Scenic" concept is most desirable, I doubt that this status is necessary for the Dolores River at this time and the Dam should take priority.

I have confidence in our "American Way" and look forward to the day when the Dam is dedicated. McPhee Dam

Sincerely,


James L. Welsch
Lt. USNR (Ret.)

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ATTACHMENTS

Chemical Analyses of Water Samples^{1/}

ATTACHMENT 1

				Drinking water standards				
Constituents	Units	Number of samples	Sampling period	Concentration		Public Health Service	Colorado	Number of times exceeded
				Min.	Avg.			
DOLORES RIVER AT DOLORES								
Temperature	°F	36	4-69 to 7-75	29	44.61	74		
Turbidity	FTU	26	4-69 to 7-75	1.2	13.14	111.0		
Conductivity (25°C)	Micro-mho	36	4-69 to 7-75	5.8	334.08	593		
Dissolved Oxygen	mg/l	33	4-69 to 7-75	5.1	8.80	11.5		
B.O.D. (5 day)	mg/l	18	9-69 to 7-75	.3	1.22	2.5		
pH	su	35	4-69 to 7-75	7.3	8.17	9.2		
Total dis. solids	mg/l	6	4-74 to 7-75	150	257.33	333	500	0
Ammonia	mg/l	29	4-69 to 7-75		.046	.33		
Nitrite	mg/l	28	4-69 to 7-75		.003	.020		
Nitrate	mg/l	29	4-69 to 7-75		.101	.50	45	0
Phosphorus	mg/l	23	4-69 to 11-73		.083	.20		
Total phosphates	mg/l	6	4-74 to 7-75		.045	.24		
Cyanide	mg/l	23	4-69 to 7-75		0.000	0.000	.20	0
Total hardness	mg/l	27	4-69 to 7-75	64	168.44	265		
Calcium	mg/l	27	4-69 to 7-75	9.2	51.4	80		
Magnesium	mg/l	27	4-69 to 7-75	5	9.81	20	125	0
Sodium	mg/l	27	4-69 to 7-75	2	10.89	21		
Sodium absorption ratio (SAR)		27	4-69 to 7-75	.1	.367	.7		
Chloride	mg/l	26	4-69 to 7-75	5	19.19	62	250	0
Sulfate	mg/l	28	4-69 to 7-75	14	40.57	71	250	0
Fluoride	mg/l	25	4-69 to 7-75		.260	.7		0
Arsenic	µg/l	25	4-69 to 7-75		.160	4	50	0
Boron	µg/l	28	4-69 to 7-75		35.36	180		
Cadmium	µg/l	24	4-69 to 7-75		0	0	10	0
Chromium	µg/l	25	4-69 to 7-75		0	0	50	0
Copper	µg/l	25	4-69 to 7-75		0	0	1,000	0
Iron	µg/l	26	4-69 to 1-75	50	151.54	330	300	1

^{1/} Storet data from Air and Water Surveillance and Analysis Division, Environmental Protection Agency, Denver, Colorado

Chemical Analyses of Water Samples									
Constituents	Units	Number of samples	Sampling period	Concentration			Drinking water standards		
				Min.	Avg.	Max.	Public Health Service	Colorado	Number of times exceeded
Lead	µg/l	25	4-69 to 7-75		4.44	67	50	50	1
Manganese	µg/l	24	4-69 to 7-75		2.08	50	50	50	0
Molybdenum	µg/l	9	2-71 to 7-75		0	0			
Silver	µg/l	7	4-69 to 7-75		0.0	0.0	50		
Zinc	µg/l	26	4-69 to 7-75		13.08	140	5,000	5,000	0
Mercury	µg/l	4	11-70 to 3-72		.125	.5			
Selenium	µg/l	25	4-69 to 7-75		.08	2	10	10	0
Radioactivity:									
Dissolved alpha	pc/l	4	11-69 to 5-75	8.90	20.70	44.1			
Dissolved beta	pc/l	2	4-69 to 3-75	.28	5.64	11.0			
DOLORES RIVER AT BEDROCK, COLORADO									
Temperature	° F	143	8-70 to 8-73	32	51.80	88.70			
Conductivity		142	8-70 to 8-73	220	984	6000			
Conductivity		51	9-64 to 6-66	215	835	1780			
Dissolved oxygen	mg/l	58	7-72 to 8-73	5.4	9.5	14.1			
pH		51	9-64 to 6-66	7.0	7.8	8.6			
Bicarbonate	mg/l	51	9-64 to 6-66	87	164.7	245			
Calcium	mg/l	51	9-64 to 6-66	30	72	356			
Magnesium	mg/l	51	9-64 to 6-66	4.9	19.4	39			
Sodium	mg/l	51	9-64 to 6-66	6.9	72.9	188			
Potassium	mg/l	51	9-64 to 6-66	1.0	3.8	8.7			
Chloride	mg/l	51	9-64 to 6-66	4.9	90.1	288			
Sulfate	mg/l	51	9-64 to 6-66	26	157.8	916			
Boron	mg/l	1	9-64		200				
*pH	su	208	8-71 to 9-75	7.2	8.0	8.5			
*Temperature	° F	208	8-71 to 9-75	32	52	89			
*Conductivity		208	8-71 to 9-75	201	1106	4470			
*Total dissolved solids	mg/l	208	8-71 to 9-75	3	702	3670			
*Obtained from U.S. Geological Survey information									

Chemical Analyses of Water Samples						Drinking water standards		
Constituents	Units	Number of samples	Sampling period	Concentration		Public Health Service	Colorado	Number of times exceeded
				Min.	Avg.			
*Calcium	mg/l	208	8-71 to 9-75	13	81.8			460
*Magnesium	mg/l	208	8-71 to 9-75	4	25.1			132
*Sodium	mg/l	208	8-71 to 9-75	1	117			759
*Potassium	mg/l	208	8-71 to 9-75	.8	6.1			28.2
*Carbonate	mg/l	208	8-71 to 9-75	2.1	7.34			15.
*Bicarbonate	mg/l	208	8-71 to 9-75	74	174.71			332
*Chloride	mg/l	208	8-71 to 9-75	4	150			1169
*Sulfate	mg/l	208	8-71 to 9-75	14	210.8			2170
McELMO CREEK WEST OF CORTEZ, COLORADO								
Temperature	°F	46	1-68 to 5-75	32	50.9			81
Turbidity	FTU	36	3-68 to 5-75	8.4	309.4			2500
Conductivity	Micromho	45	1-68 to 5-75	290	2817.2			4963
Dissolved oxygen	mg/l	42	1-68 to 5-75	4.8	7.8			11.1
B.O.D. (5 day)	mg/l	19	7-68 to 5-75	1.1	2.6			7.0
pH	su	45	1-68 to 5-75	7.6	8.2			8.9
* Total dissolved solids	mg/l	183	6-72 to 6-76	1350	2653		4050	
Ammonia	mg/l	33	9-68 to 5-75	.0	.16		1.2	
Nitrite	mg/l	31	11-68 to 5-75	.0	.05		.26	
Nitrate	mg/l	32	9-68 to 5-75	1.0	4.6		17.1	
Phosphorus	mg/l	26	9-68 to 5-73	.0	.30		1.0	
Total phosphates	mg/l	6	4-74 to 5-75	.28	.84		1.6	
Cyanide	mg/l	22	3-68 to 5-75	.0	.000591		.012	
Calcium	mg/l	37	3-68 to 5-75	34.4	330.6		636.8	
Magnesium	mg/l	37	3-68 to 5-75	8.	183.9		380	
Sodium	mg/l	37	3-68 to 5-75	100	236.5		590	
Chloride	mg/l	37	3-68 to 5-75	26	51		94	
Sulfate	mg/l	31	9-68 to 5-75	873	1779.7		2996	
Fluoride	mg/l	22	3-68 to 5-75	.30	.7		1.6	
Arsenic	µg/l	21	3-68 to 5-75	.0	.0		.0	

* Obtained from Geological Survey information.

Chemical Analyses of Water Samples							Drinking water standards		
Constituents	Units	Number of samples	Sampling period	Concentration		Public Health Service	Colorado	Number of times exceeded	
				Min.	Avg.				
Boron	µg/l	35	1-68 to 5-75	.0	200	760			
Cadmium	µg/l	33	3-68 to 5-75	.0	.0	.0			
Chromium	µg/l	20	3-68 to 5-75	.0	.0	.0			
Copper	µg/l	20	3-68 to 5-75	.0	.0	.0			
Iron	µg/l	36	3-68 to 5-75	.0	1322.7	42000			
Lead	µg/l	20	3-68 to 5-75	.0	5.1	67			
Manganese	µg/l	35	3-68 to 5-75	.0	60	420			
Molybdenum	µg/l	9	2-71 to 5-75	.0	3.3	15			
Silver	µg/l	9	11-68 to 5-75	.0	.0	.0			
Zinc	µg/l	34	3-68 to 5-75	.0	52.6	800			
Selenium	µg/l	36	1-68 to 5-75	.0	7.41	20			
Radium									
Alpha	pc/l	27	9-68 to 5-75	.0	26.2	101.5			
Beta	pc/l	19	9-69 to 5-75	.4	11.5	29.7			
Mercury	µg/l	4	11-70 to 5-72	.0	.0	.0			
Fecal coliforms	no./								
	100 ml.	39	1-68 to 5-75	5.	53722.7	1750000			
Total coliforms	no./								
	100 ml.	40	1-68 to 5-75	21	72173	542000			
Sodium absorption ratio	Ratio	37	3-68 to 5-75	1.3	2.95	15			
MANCOS RIVER 3 MILES NORTH OF THE COLORADO-NEW MEXICO STATE LINE									
Temperature	°F	36	1-68 to 5-72	32	51.33	81			
Turbidity	FTU	28	3-68 to 4-72	6.5	238.2	1500			
Conductivity		35	1-68 to 5-72	473	1647	2700			
Dissolved oxygen	mg/l	32	1-68 to 5-72	5.1	7.9	12.1			
B.O.D. (5 day)	mg/l	10	7-68 to 4-72	.60	1.55	2.90			
pH	su	36	1-68 to 5-72	7.50	8.24	9.30			
Phosphorus	mg/l	23	9-68 to 4-74	.05	.10	.6			
Cyanide	mg/l	16	3-68 to 11-74	.0	.0	.0			
Calcium	mg/l	28	3-68 to 4-74	55.6	196.2	648.0			

Chemical Analyses of Water Samples

Constituents	Units	Number of samples	Sampling period	Concentration			Drinking water standards	
				Min.	Avg.	Max.	Public Health Service Colorado	Number of times exceeded
Magnesium	mg/l	28	3-68 to 4-74	3.00	92.65	243.00		
Sodium	mg/l	28	3-68 to 4-74	14.00	99.32	166.00		
Sodium absorption ratio		28	3-68 to 4-74	.3	1.5	3.0		
Chloride	mg/l	29	3-68 to 4-74	7	17.86	31		
Sulfate	mg/l	24	9-68 to 4-74	156	877.42	1301		
Total dissolved solids	mg/l	36	1-68 to 11-74	375	1690	2780		
Ammonia	mg/l	25	9-68 to 11-74	.0	.04	.25		
Nitrite	mg/l	24	11-68 to 11-74	.0	.005	.034		
Nitrate	mg/l	25	9-68 to 11-74	.0	.26	1.0		
Total phosphates	mg/l	25	9-68 to 11-74	.0	.15	.030		
Fluoride	mg/l	14	3-68 to 5-72	.45	.094	.6		
Arsenic	µg/l	26	3-68 to 4-72	0	.77	20		
Cadmium	µg/l	15	3-68 to 5-72	0	0	0		
Chromium	µg/l	14	3-68 to 5-72	0	0	0		
Copper	µg/l	14	3-68 to 5-72	0	0	0		
Iron	µg/l	27	3-68 to 5-72	0	170	500		
Lead	µg/l	14	3-68 to 5-72	0	0	0		
Manganese	µg/l	28	3-68 to 5-72	0.0	9.64	170.0		
Molybdenum	µg/l	2	8-71 to 4-72	0	0	0		
Silver	µg/l	8	11-68 to 3-72	0	0	0		
Zinc	µg/l	29	11-68 to 6-72	0	126.55	1600		
Selenium	µg/l	28	1-68 to 5-72	0	1.71	11		
Radium								
Alpha	pc/l	11	3-68 to 3-72	1	14.91	50		
Beta	pc/l	4	9-69 to 5-72	2	9.25	17		
Total coliforms	no./100 ml.	32	1-68 to 6-72	2	2297.9	30000		
Fecal coliforms	no./100 ml.	30	1-68 to 6-72	2	185.36	2300		
Mercury	µg/l	8	11-70 to 5-72	0		2.0		

Chemical Analyses of Water Samples					Drinking water standards			
Constituents	Units	Number of samples	Sampling period	Concentration		Public Health Service	Colorado	Number of times exceeded
				Min.	Avg.			
SAN JUAN RIVER NEAR THE COLORADO-NEW MEXICO STATE LINE								
Temperature	° F	44	1-68 to 1-75	32	52.34	82		
Turbidity	FTU	34	3-68 to 1-75	12.3	273.51	2000		
Conductivity	Micromho	44	1-68 to 1-75	285	671.41	1300		
Dissolved oxygen	mg/l	40	1-68 to 1-75	4.40	8.05	13.60		
B.O.D. (5-day)	mg/l	16	2-69 to 1-75	.8	1.9	3.6		
pH	su	43	1-68 to 1-75	7.4	8.18	9.1		
Phosphorus	mg/l	25	9-68 to 5-73	0	.17	.8		
Cyanide	mg/l	21	3-68 to 11-74	0	0	0		
Calcium	mg/l	32	3-68 to 1-75	44.8	94.7	120		
Magnesium	mg/l	32	3-68 to 1-75	5.0	22.0	105.0		
Sodium	mg/l	32	3-68 to 1-75	19.0	51.0	110.0		
Sodium absorption								
ratio	Ratio	32	3-68 to 1-75	.5	1.3	3.6		
Chloride	mg/l	33	3-68 to 1-75	8	16.4	35		
Sulfate	mg/l	28	9-68 to 1-75	95	202	419		
Total dissolved								
solids	mg/l	36	1-68 to 1-75	215	518	1075		
Ammonia	mg/l	29	9-68 to 1-75	0	.05	.40		
Nitrite	mg/l	27	11-68 to 1-75	0	.010	.140		
Nitrate	mg/l	30	9-68 to 1-75	0	.75	1.8		
Total phosphates	mg/l	4	4-74 to 1-75	.03	.10	.18		
Fluoride	mg/l	21	3-68 to 1-75	.20	.49	1.10		
Arsenic	µg/l	21	3-68 to 1-75	0	0	0		
Baron	µg/l	24	1-68 to 1-75	0	70	260		
Cadmium	µg/l	31	1-68 to 1-75	0	0	0		
Chromium	µg/l	20	3-68 to 1-75	0	0	0		
Copper	µg/l	20	3-68 to 1-75	0	0	0		
Iron	µg/l	34	3-68 to 1-75	0	239.7	1000		
Lead	µg/l	20	3-68 to 1-75	0	0	0		
Manganese	µg/l	32	3-68 to 1-75	0	.9	30		

Pesticide levels of streams draining the project area
(Unit: mg/l)

Location and date of grab sample	Alpha		Beta	Aldrin		Heptachlor epoxide	Dieldrin	Total DDT	Organic phos- phates		2,4-D 2,4,5-T	PCB
	BHC	BHC		BHC	BHC							
Yellow Jacket Creek at State line, September 27, 1976	0.009	0.002	0.002	0.008	0.001	0.001	0.001	0.006	ND*	<0.001	<0.001	<0.001
Mancos River at Highway 666, September 27, 1976	.021	.005	.005	.004	<.001	<.001	<.001	.003	ND	<.001	<.001	<.001
Navajo Wash at road to Towaoc, September 27, 1976	.011	.002	.002	.004	.001	.001	<.001	.005	ND	<.001	<.001	<.001
McElmo Creek at State line, September 27, 1976	.015	.006	.006	.005	.002	.002	.001	.005	ND	<.001	<.001	<.001
Alkali Canyon at McElmo Creek, September 27, 1976	.005	.001	.001	.001	.002	.002	<.001	.002	ND	<.001	<.001	<.001
San Juan River below McElmo above Montezuma Creek, September 27, 1976	.025	.012	.012	.004	.002	.002	.008	.007	ND	<.001	<.001	<.001
Montezuma Creek at Highway 262 crossing, September 27, 1976	.033	.025	.025	.001	.003	.003	.041	.005	ND	<.001	<.001	<.001
Recommended EPA limit for public and farmstead wa- ter supplies				1	.1	.1	1	50	100		<u>1/20</u> <u>2/2</u>	

1/ Limit for 2,4-D.
2/ Limit for 2,4,5-T.
ND* Not detected.

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

BLM Library
Denver Federal Center
Bldg. 50, OC-521
P.O. Box 25047
Denver, CO 80225

Form 1279-3
(June 1984)

BORROWER'S CARD

TD 195 .W3 D64 1977

Final environmental
statement

DATE LOANED	BORROWER
5/25/89	Allen Cooperia

USDI - ELM

